

Hybrid Hydraulic System

【 Super Unit 】

SUT03S15L16-10-F

SUT03S30L10-10-F

Instruction Manual



DAIKIN INDUSTRIES, LTD.

DAIKIN INDUSTRIES, LTD.

Oil Hydraulics Division

《SAFETY PRECAUTIONS》

■ Before Usage

- To ensure to notify these contents of this document for user.
- Add this contents to your machine's handling manual which uses this product.
- Before installation, operation or maintenance, read thoroughly this handling manual and other attached documents and learn equipments knowledge, safety information and attentions, then use this product properly.
- To ensure keeping this manual, attached documents and supply specifications and so on, whenever user enable read these documents.
- So all figure or photo in this manual are sometimes drawn the state of removing the cover or safety insulate object to explain details, which you operate surely put the cover or insulate object as it was before and operate following this manual.
- This manual may be changed for improvement of the product or alteration of specifications or improve this manual more easily.
- This document is about safety handling of our hydraulic unit. Prepare date for safety handling according to the standard for safety operation or maintenance of your machine.

Symbols of safety precautions in this manual

• In this manual, safety precautions are represented and classify 3 rank, “▲ Danger”, “▲ Warning” and “▲ Caution”.

▲ Danger: If you ignore this symbol and handle improperly, it may pose a high risk of causing death or serious injury.

▲ Warning: If you ignore this symbol and handle improperly, it may pose the risk of causing death or serious injury.

▲ Caution: If you ignore this symbol and handle improperly, it may pose the potential risk of causing injury or damage to the product or property.

Although the matter is mentioned in “▲ Caution” symbol, there will cause serious result.
Be sure to observe these precautions.

Safety

General

▲ Danger

- Qualified people perform the task such as transportation, installation, piping, wiring, operation, handling, maintenance, and inspection.
- When working, make use of protective tools (uniform, safety belt, helmet, safety shoes, gloves, etc).
- Do not use another specifications which is mentioned in the catalog, or delivery specifications.

▲ Caution

- Be sure to enforce daily inspection (it is mentioned in this document, or in attached document.)
- Do not stand, beat or add pressure on the products, or you may be injured and the product is damaged.

《Exemption Clause》

- Damages owing to earthquake, fire, and action of the third party, other accidents, intentional or negligence, misuse of customers, use under unusual conditions we would exempt from any responsibilities.
- Incidental damages (loss of business profit, business suspension) owing to usage of this product, or impossibility of usage, we would exempt from any responsibilities.
- Accidents and damages caused by disobeying manuals or supply specifications, we would exempt from any responsibilities.
- Damages caused by wrong working owing to combination of connecting equipment, we would exempt from any responsibilities.

《Limitation of uses》

- Make sure to consider the situation, in case of life threatening owing to breakdown or wrong working of this machine, or possibilities of danger to the human body.
- Though, this product manufactured under strict quality control, in case of using important equipment, to prevent serious accident or damage from failure of this machine, install safety equipment.

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【1. Preface】

Thank you for choosing the “Super Unit” series of IPM motor driven hydraulic unit from DAIKIN. IPM motor driven hydraulic unit “Super Unit” realized overwhelming energy-saving and high function by adopting hydraulic technology and the energy-saving IPM motor driven system of our own development. When using “Super Unit:SUT series”, manage proper handling and maintenance after reading this manual thoroughly to cross for a long time and to keep good performance.

Approve it in case the contents of this manual are sometimes partly different from the product because of the change of the parts according to the improvement of quality, performance and other circumstances.

【2. Feature and Construction】

Multiple speed and multiple pressure control and shock-less control function have loaded.

Multiple pressure and flow control are available by choosing (input the contact point) the PQ characteristic of 4 patterns set up in the controller in advance from the main machine.

Set and adjust the increase/reduce time as for P characteristic, and acceleration/deceleration time as for Q characteristic in changeover make shock-less control possible.

【 3. Nomenclature 】

(a)	(b)	(c)	(d)		(e)		(f)		(g)
SUT	03	S		L		-		-	F

(a) Series name
 • SUT : SUT Series

(b) Tank Volume
 • 03 : 30L

(c) Pump type
 • S : Single gear pump

(d) Max. discharge flow of the pump
 • 30 : 25L/min
 • 15 : 18L/min

M F G . N o

(h)	(i)	(j)		(k)
			-	-

(h) Design NO.

(i) Hard change record

(j) Soft change record

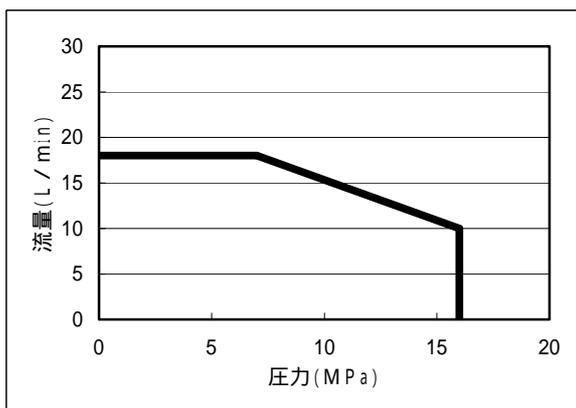
(k) Serial NO.

(e) Max. working pressure
 • 10 : 10.0MPa
 • 16 : 16.0MPa

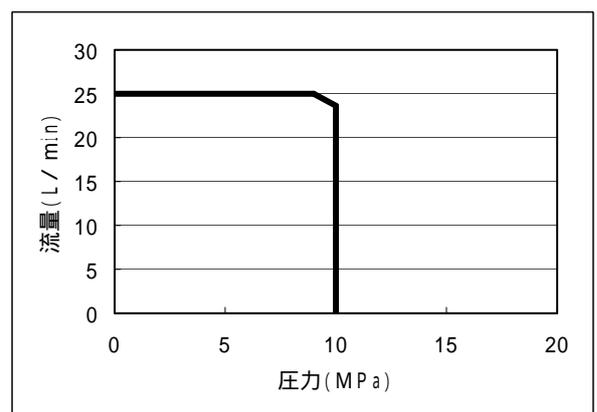
(f) Design NO.
 • Progress according to the product has been changed.

(g) Noise filter specification
 • F : With noise filter

Output Characteristic
 SUT03S15L16-10-F



SUT03S30L10-10-F



【 4. Specifications and operating conditions 】

Specifications

	SUT03S15L16-10-F	SUT03S30L10-10-F
Max. working pressure (MPa)	16.0	10.0
Max. discharge flow rate ^(Note 1) (L/min)	18.0	25.6
Pressure Adjusting range (MPa)	1.5 ~ 16.0	1.5 ~ 10.0
Discharge rate adjusting range ^(Note 1) (L/min)	3.6 ~ 18.0	3.6 ~ 25.6
Power Source	3 200 V/50 Hz 200V/60 Hz 220V/60 Hz	
External input Signal (3ch)	Photo-coupler insulation, DC24V (Max.27V) 5mA/1ch	
External output signal Alarm output (1ch)	Relay output Contact capacity :DC30V 0.5A (load resistance) 1c contact	
Standard painting	Ivory white (Munsell symbol 5Y7.5/1)	

^(Note 1) It is preset to be Max. discharge flow rate when delivered. (Max. discharge flow rate is theory value but not guarantee value.)

Refer to “setup range” of P27,P28 about initial value of set up mode at shipping.

As for other specifications, confirm delivery specifications (model figure).

- Although Max. pressure and Max. flow rate can be set up beyond the above adjustment range, be sure to observe above mentioned pressure range and flow.
- This hydraulic unit has a safety valve built in, and it is adjusted maximum working pressure +1.0MPa . Even if it is used at low pressure, it is not necessary to adjust.
- However, in case that it is necessary to restrain surge pressure at actuator operation, adjust in accordance with “Adjustment points of safety valve” of the attached document.

Working condition

Hydraulic oil ^(Note2)	Petroleum series of specific hydraulic oil/anti-wear hydraulic oil (Refer to our [General Hydraulic Catalog (HK196/TP)] to see the recommended brands.) • Viscosity grade : ISO VG 32 ~ 68 • Viscosity range : 15 ~ 400 mm ² /s • Contamination level : within NAS class 9
Tank oil temperature	0 ~ 60 (recommended working temperature range : 15 ~ 50) ^(Note3)
Room temperature	0 ~ 35
Humidity	Below 85 %RH
Installation place	Indoor (must be fixed by screws)
Others	• Be sure to install no-fuse-breaker and short circuit breaker. • The electric wire connecting is wired to satisfy an European standard EN60204-1. • Do not turn ON/OFF the power frequently, it may cause remarkable short life of the controller. Use the stop control function, in case of using operation/stop in the frequency. • Ground (earth) terminal must be down to ground.

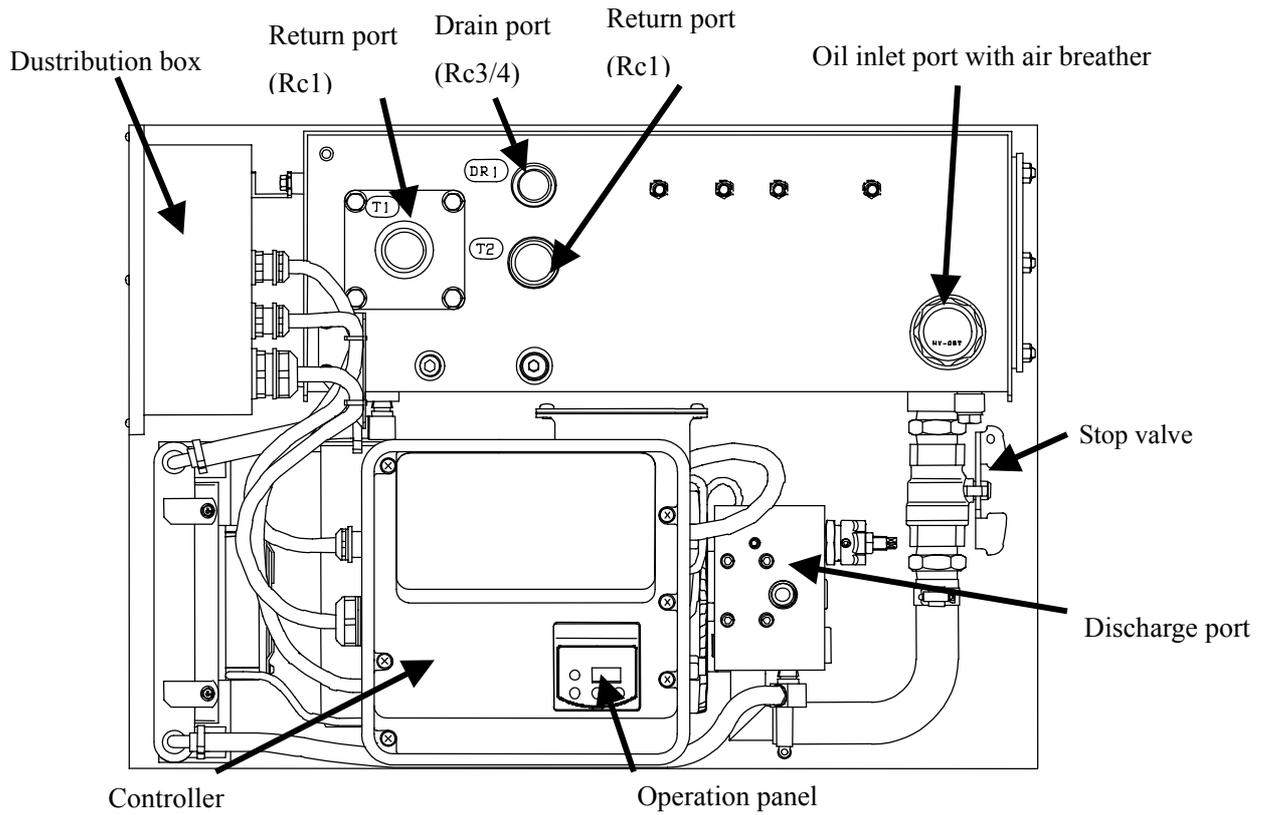
^(Note2) Do not use any hydraulic fluid other than mineral type (hydrous or synthetic) hydraulic oil (like water-glycol).

^(Note3) In case of using except recommended working temperature range, it may cause large pulsatory motion of pressure or reduce discharge volume, but it is not abnormal.

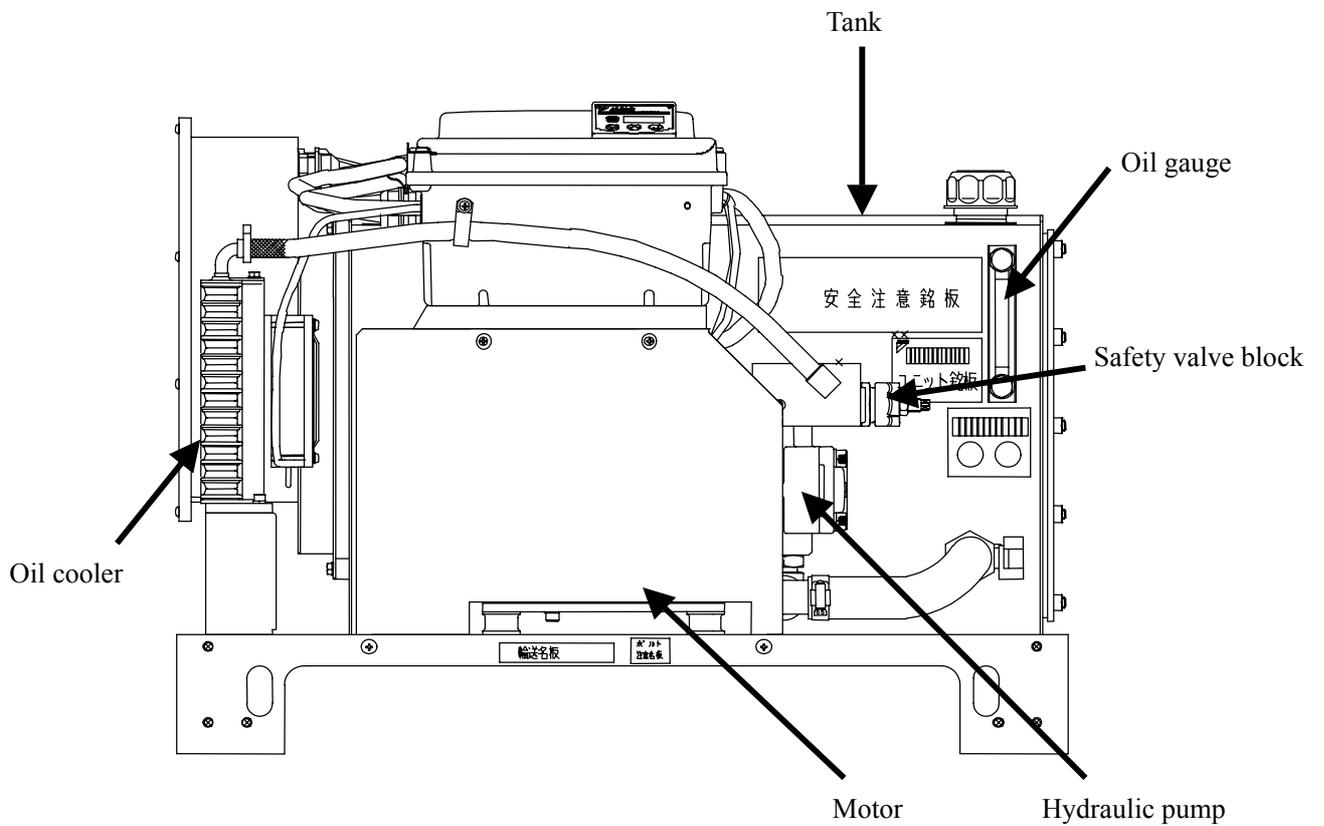
【 5. Attention point in use 】

- (1) This hydraulic unit is installed to the motor pump with vibration absorbing rubber so that the vibration of the motor pump may not be effected to the unit. As the piping to the unit, it is better to use hose connection.
- (2) This hydraulic unit is equipped a fan motor to cool off the operation oil and the motor. Do not put an obstacle within 10cm from inhalation and exhaust side of the fan motor because of its ventilation.
- (3) This hydraulic unit is adopted IPM motor, and reverse electric power occurs at the time of the diverting operation (regenerative operation). When switching of the high frequency on the operation condition that it is easy to cause reverse electric power becomes regenerative over-load, and then it may cause the unit stop.
- (4) This hydraulic unit equipped with safety valve. Though this safety valve is set up the regular pressure when delivered, the long repetition operation of the equipment and contaminant in the hydraulic oil may decrease the setup pressure of the safety valve.
In this case, re-adjust the setup pressure of the safety valve according to “Adjustment point of the safety valve (attached document)”.

【 6. Parts 】



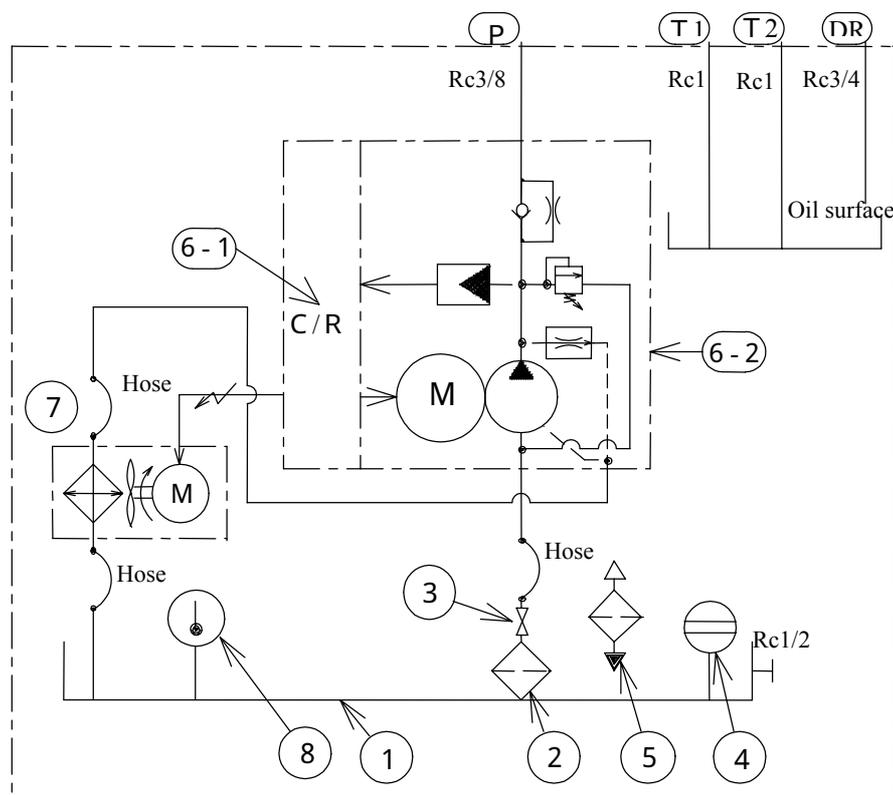
Unit from the top view



Unit from the front side

【 7. Hydraulic circuit 】

Hydraulic circuit



Parts

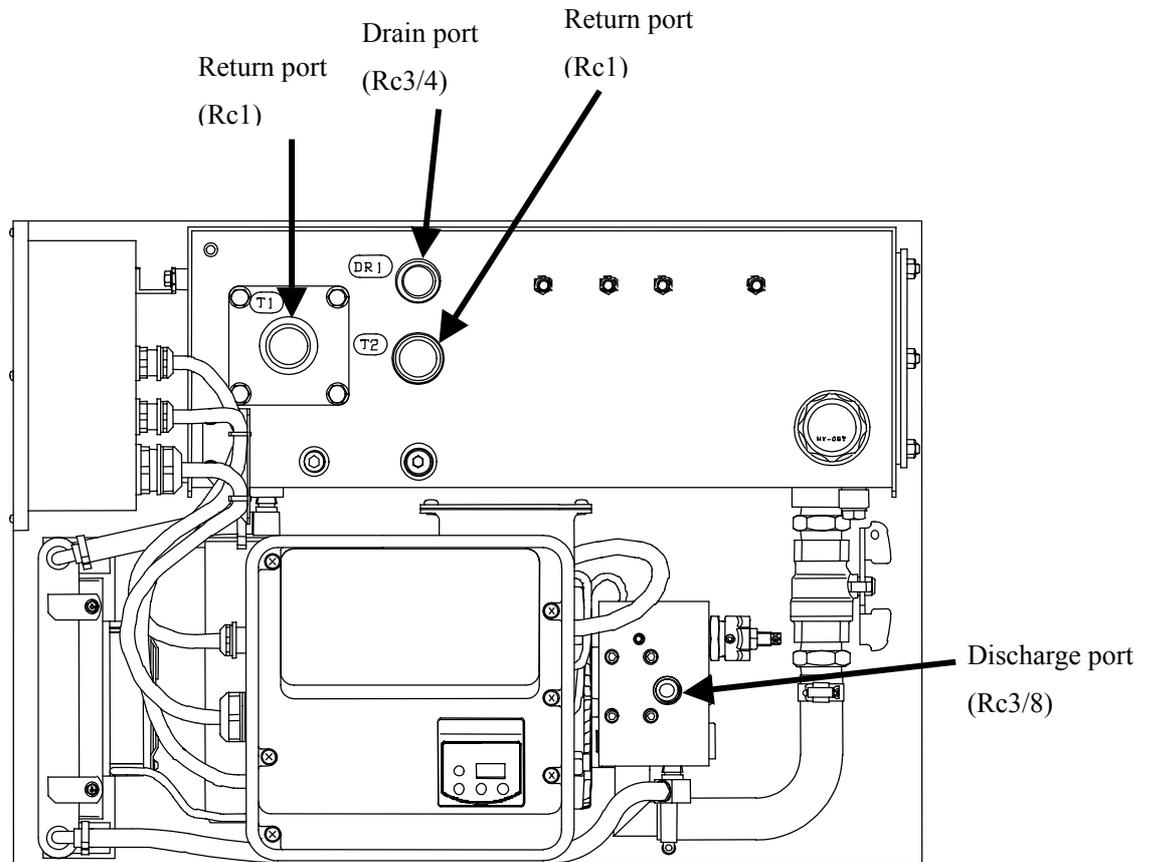
Part No.	Name
1	Tank
2	Suction filter
3	Stop valve
4	Oil gauge
5	Oil inlet port with air breather
6-1	Controller
6-2	Inverter driving pump
7	Oil cooler
8	Thermo meter

Piping

Since this hydraulic unit provided with the return filter and 1 return port (in the oil) and 1 drain port (at the oil level) and 1 discharge port as well, piping according to the equipment.

Each piping port has taper plug (vinyl cap) when delivered.

Tighten the pipe with seal tape.



Unit from the top view

Caution

- This hydraulic unit has a safety valve built in. In case of installing special inline check valve on discharge port, resonance occurs and it may give bad influence to the main machine, so do not use special inline check valve.

【 8.Points for transporting, moving and installing 】

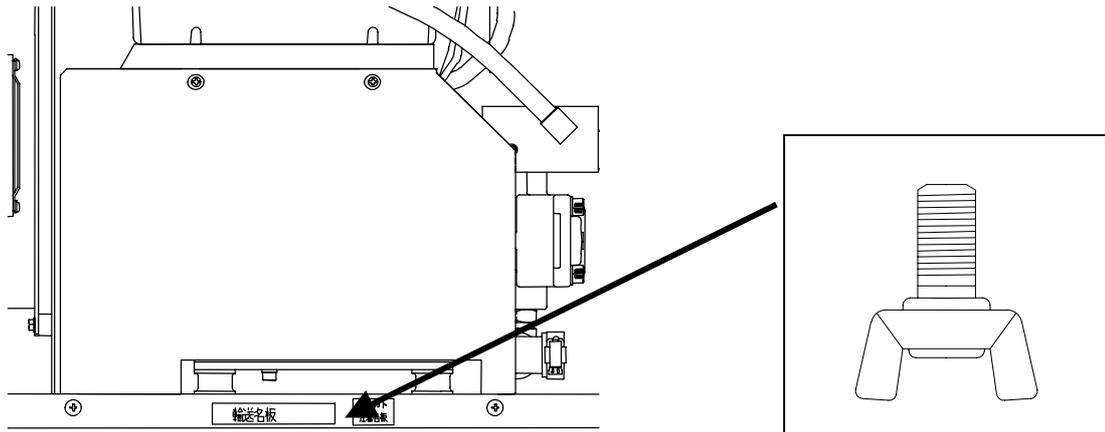
- Though the vibration absorbed rubber is attached to the leg of the motor pump because of the low vibration, the low noise. It is fixed with a wing bolt (2 of M8 × L15) as a transport vibration countermeasure when delivered.

Operation

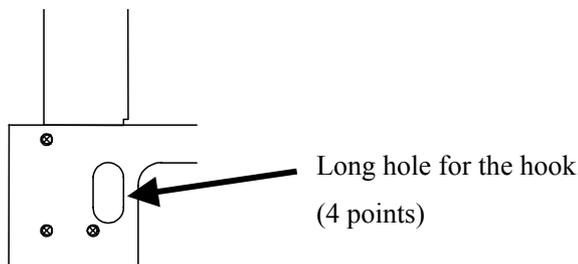
- Before operation, remove the wing bolt (2 of M8 × L15). If it is operated without removing the bolt, it may cause loud vibration and noise.

Transporting

- When it is being transported, install the motor base on the base tank with the wing bolt (2 of M8 × L15) surely, and fix it securely to protect the vibration absorbing rubber.



Wing bolt for fixing
(Back of the body: 2 points)



▲ Danger

- In case that it is suspended except for the long hole for the hook (pump piping), it is dangerous to fall and turnover.
- Confirm the weight of the hydraulic unit, and suspend it within the rated load of the hanger-hook.

▲ Warning

- When transporting, make sure to suspend equally with four position of the long hole for the hook.
- Never approach during transport by hanger hook. It is dangerous to be injured due to fall and turnover.

▲ Caution

- Do not move the tank with filling oil. (The oil leaking and air-mixing will cause inferior operation.)
- During transportation, be sure to fix it so that it may not be moved by vibration and another force.

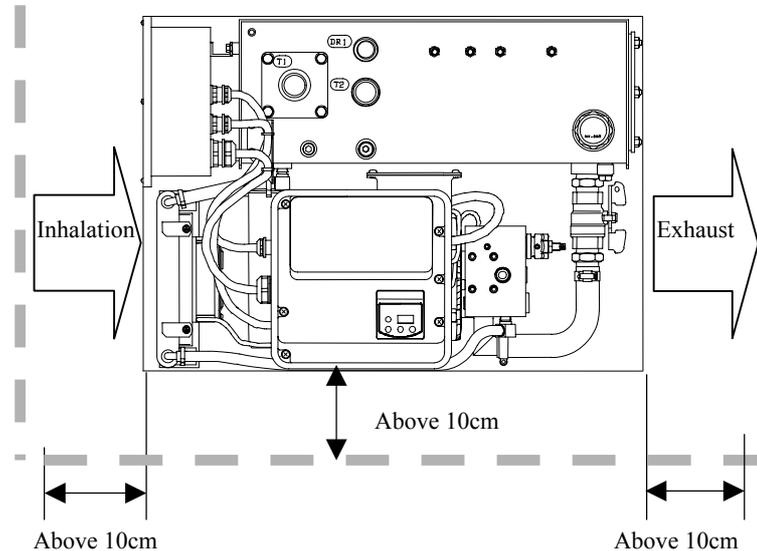
Weight (without including operating oil)

Type	Weight
SUT03S16L15-10-F	68Kg
SUT03S30L10-10-F	68Kg

Points for installation

Securing of ventilation

Do not put the obstacle that disturbs inhalation/exhaust of the oil cooler within 10cm from the end of the unit. Moreover, install it in the good ventilation so that the unit may not be filled with heat, and be careful that temperature of inhalation becomes fixed surrounding temperature (less than 35).



Warning

- When it is used in where there is no space of inhalation/exhaust, and heat place, the heat exchange function of the oil cooler/fan motor declines, and finally, oil temperature and temperature of the hydraulic equipment becomes unusual high temperature.
- In case of touching high temperature part, you may be burnt.

Caution

- When it is used in where there is no space of inhalation/exhaust, and heat place, the motor and the controller become high temperature, and the life of the machine will be shortened apparently.
- When the motor and the controller become high temperature, temperature protection suspends its operation. (In case the motor and the controller become unusual high temperature, warning signal and alarm signal are outputted.)
- If using under high temperature condition continuously, it causes troubles and shorten the life of the hydraulic equipment such as the pump and the valve as well as the above electric parts.
- If using under high temperature condition continuously, it makes the quality of the hydraulic oil lower, and it's life becomes short.

Installation on horizontal place

- Install the hydraulic unit on the horizontal table or the horizontal floor.
- Fix the hydraulic unit not to move.
- As for method of installation and position, confirm delivery specifications (model figure).

Warning

- If the hydraulic unit is not fixed with bolt, it is dangerous because of falling down and moving around by the hydraulic reverse-force in the pipes, so the unit must be fixed.

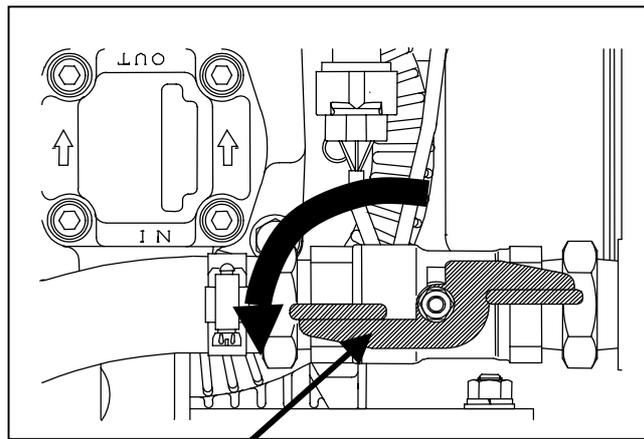
Caution

- In case it is installed in the slope, there will be oil-leaking and air-mixing cause the unusual noise and shorten the machine life. So be sure to install it horizontally.

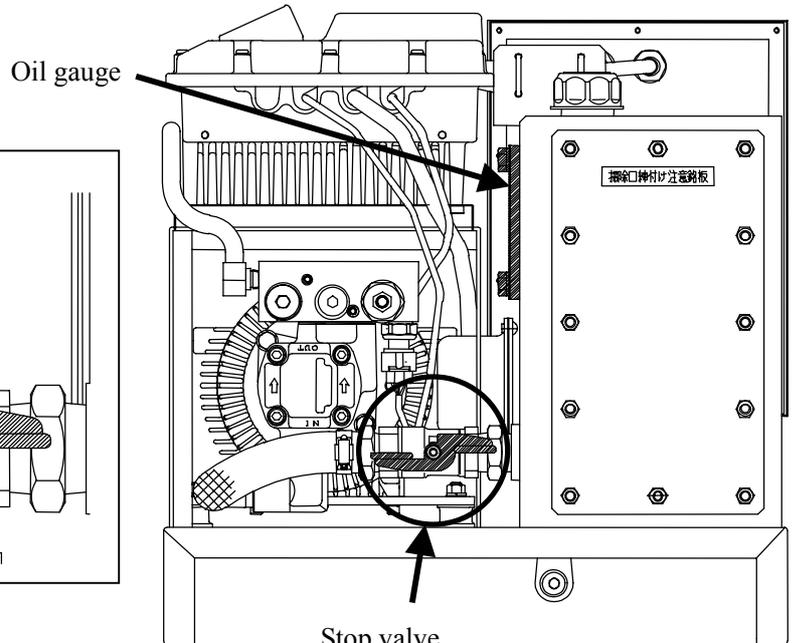
【 9. Preparation for operation 】

Filling hydraulic oil

- Remove the oil inlet port with air breather to turn counterclockwise, and put pure hydraulic oil (within NAS 9 class) in the tank. The oil volume should be kept that the float of the oil gauge is between the red line and the yellow line.
- Use the hydraulic oil appropriate to the specifications as it was mentioned in page 7.
- Confirm the stop valve is opened.



Stop valve has been opened.



Stop valve

- Make sure to open in operation.
(lever position horizontal: open
lever position vertical: close)

Tank capacity (L)	Oil level range	
	Yellow line (upper)	Red line (lower)
30	30L	23L

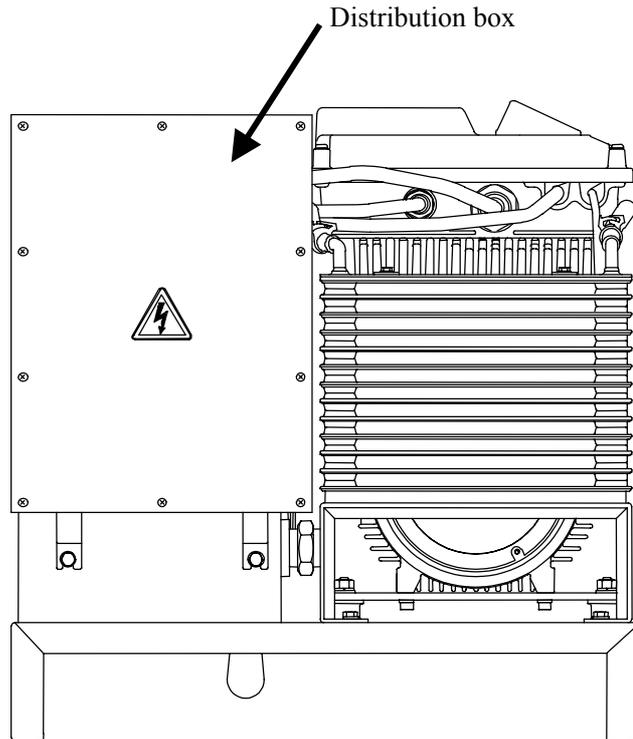
 Caution

If it operates without putting oil in the tank, burnt and abrasion occur in the pump body, and it may be damaged. Make sure that the stop valve is open. If the stop valve is not open, the oil is not supplied to the pump, so burnt and abrasion occur, and it may damage the pump.

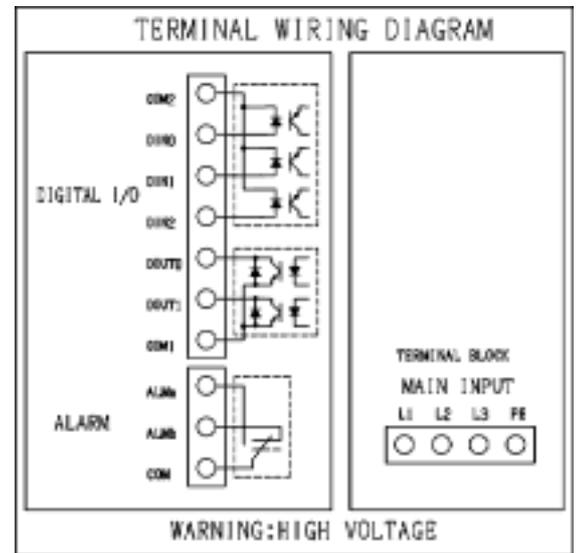
Since oil is supplied to the hydraulic circuit on the machine at the initial operation of the machine, be careful of the oil decrease inside the tank

The oil level inside the tank will vary a lot with the different hydraulic circuit on the machine, be careful that if the oil is overflowed from the tank or the oil level is lower than its usual level.

Electric wiring



Unit from the left side



Wiring diagram

 Danger

- To protect the electric circuit and prevent electric shock, install the safety device such as a no fuse breaker or a short circuit breaker on the main power source of the hydraulic unit so as to be based on the European standard (EN60204-1).
(Refer to below table for the capacity of each machine)
- Ground (earth) terminal must be down to ground. (Connect it directly not to pass through the breaker)
- Wire after installing the machine surely.
- Be sure to turn off the breaker of the main power source and confirm that the power source was interrupted before the wiring,
- Do not connect the supply line to the input and output terminal.
- Never add the excessive power voltage beyond its specifications of the hydraulic unit.
- In case of using thermal, it may work wrong way by the inverter switching.

 Caution

- Since this hydraulic unit has protect-over current function built in, thermal for protect-over current function is not necessary.

[Rated current and breaker setup value]

Type	Power source voltage and frequency			Breaker setup value
	3 200V 50Hz	3 200V 60Hz	3 220V 60Hz	
SUT03S15L16-10-F	10.9A	11.2A	10.3A	20A
SUT03S30L10-10-F	16.5 A	16.2 A	14.6A	20A

Wiring point

When wiring the main power source and the alarm output signal wire, the cover of the distribution box has to be removed.

《Removing the cover of the distribution box by loosening the cross recessed screw (M4) that installed on the cover.》

The wiring of the main power source

- (1) Wire the electric cable through the wiring port of the distribution box. Use the wire and the cable clamp to be suitable for the wiring port that satisfies protection grade over IP54.

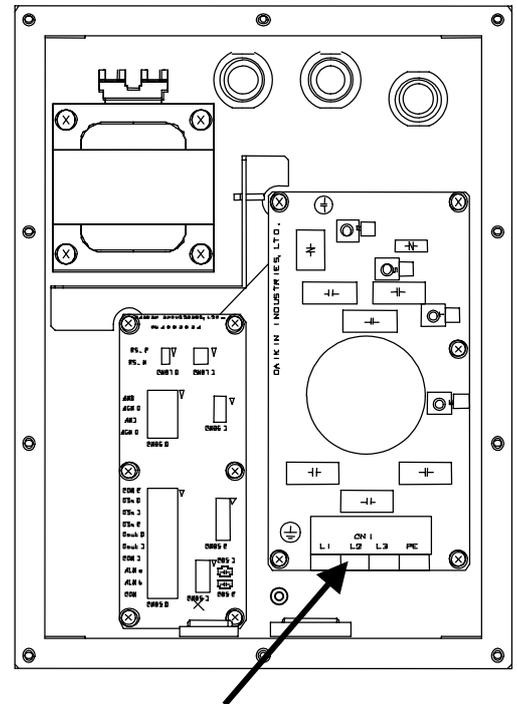
Connect the earth line (PE) to the earth terminal of the terminal stand for power source.

Connect power source line to terminal stand (L1,L2,L3) of the power source.

- (2) After wiring, be sure to install the cover of the distribution box as it was.

(M4 cross recessed screw [tightening torque: 1.0N · m]

[Recommended crimping terminal: TMEV-5.5-5]



Terminal stand for power source

《The cover of the distribution box has been removed》

 **Danger**

- Use alternating current (AC) which is suitable for the power source specifications of the product.
- Use the electric wire which is suitable for its capacity. (Refer to the below table.)
- Do not connect the power source wire (L1, L2, L3) to earth connection point.
- The earth connection point is connected with the motor frame, and ground the earth over the third class ground.
- Be careful not to damage the conductor when stripping electric wire.
- Be careful not to stick out the conductor of wiring from the terminal stand.

 **Caution**

- Use the crimping terminal for the tip of the wire.
- The wire to insert into the cable clamp is to use multiple core cables like the following recommended electric wire. In case two and more electric wire is inserted, there is a gap between the electric wire and the cable clamp, and protection grade unable to be satisfied.

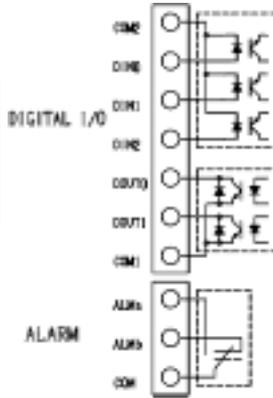
Unit type	Wire size	Recommended electric wire	Recommended crimping terminal	Recommended cable clamp
SUT03S30L10-10-F	Over 2.5mm ² (Over AWG14)	CE362 2.5mm ² × 4core (Kuramo made)	TMEV-2-5 (Nichifu made)	OA-W2216 (Ohm electrics made)

The wiring of alarm signal line

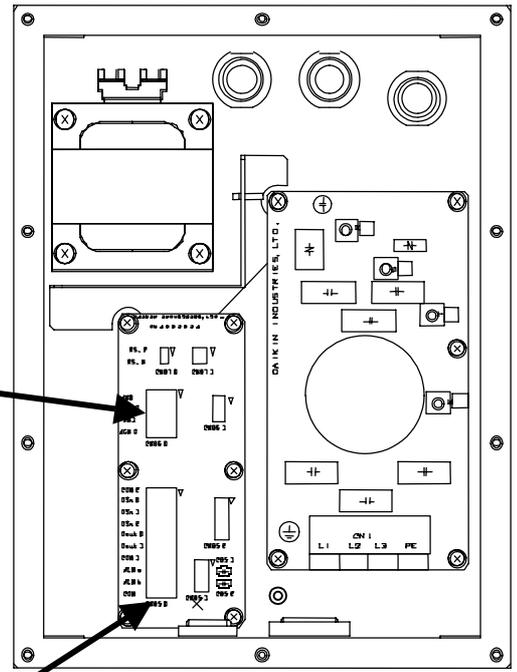
- (1) Wire the electric cable through the wiring port of the terminal box. Use the wire and the cable clamp to be suitable for the wiring port.
- (2) Confirm the wiring diagram on the cover of the distribution box, connect to the alarm signal connection on the terminal stand for power source.
- (3) After wiring, be sure to install the cover of the distribution box as it was.

[COM - ALMa]	Normal: closed	Abnormal: opened
[COM - ALMb]	Normal: opened	Abnormal: closed

Terminal stand of (Note 1) cannot be used.
Never connect the wire.



(Note 1)



Input/output signal wiring diagram Terminal stand for alarm/control signal

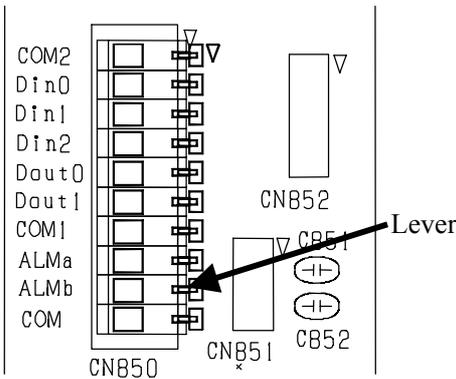
《The cover of the distribution box has been removed》

Danger

- Use the electric wire, cab-tire cable with shield which is suitable for AWG22 (0.3sq).
- Be sure to treat the end of shield cable properly, and ground the one side.
- Do not connect the alarm connect line to the terminal stand for power source.
- Be careful not to damage the conductor when stripping electric wire.
- Use DC30V for alarm connection circuit.
- Use it under the maximum load-current less than 0.5A (load resistance).
- Be careful not to stick out the conductor of wiring from the terminal stand.

Caution

- As for alarm output signal connect “ALMa” and “COM” of wiring diagram at normal operation.
- In case of preventing end of the wire from separating, treat its end with solder or use the below mentioned crimping terminal with insulation sleeve. (Refer to maker’s catalogue “WAGO made” for handling them.)
 For AWG22 0.3 sq: 216-322 light green
 For AWG20 0.5 sq: 216-221 white
 Press tool: 206-204 Bio- crimp



How to connect to the terminal stand board

- Push the lever with a driver etc.
- Make sure of stripped wire length, and insert them until the end without separating.
- Remove the driver from the lever.
- Make sure of wiring by pulling the electric wire slightly.

Stripped wire length: 6mm

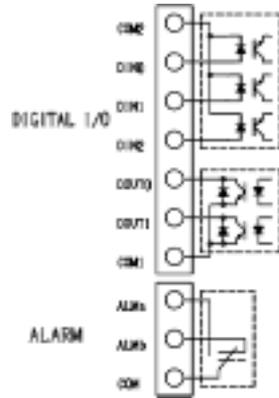


The wiring of control signal line

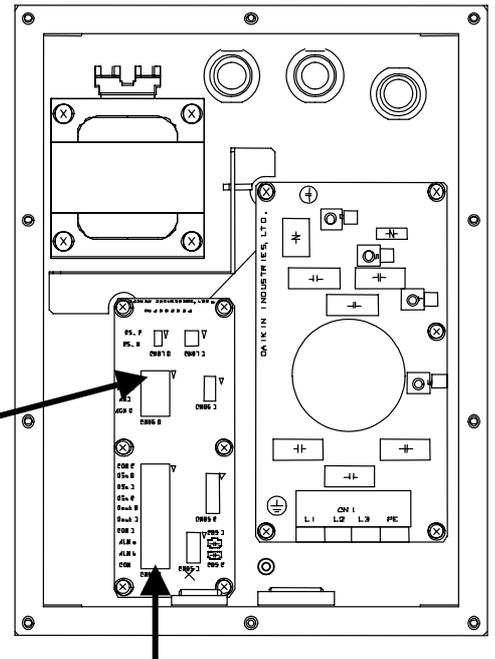
- (1) Wire the electric cable through the wiring port of the terminal box. Use the wire and the cable clamp to be suitable for the wiring port.
- (2) Confirm the wiring diagram on the cover of the distribution box, connect to the control stop signal connection on the terminal stand for power source. Refer to the below figure as for the method of the control stop signal connection.
- (3) After wiring, be sure to install the cover of the distribution box as it was.

(Wiring port is common with alarm signal.)

Terminal stand of (Note 1) cannot be used.
Never connect the wire.



(Note 1)



Terminal stand for alarm/control signal
《The cover of the distribution box has been removed》

Input/output signal wiring diagram

▲ Danger

- Use the electric wire, cab-tire cable with shield which is suitable for AWG22 (0.3sq).
- Be sure to treat the end of shield cable properly, and ground the one side.
- Do not connect the alarm connect line to the terminal stand for power source.
- Be careful not to damage the conductor when stripping electric wire.
- Use DC30V for alarm connection circuit.
- Use it under the maximum load-current less than 0.5A (load resistance).
- Be careful not to stick out the conductor of wiring from the terminal stand.

▲ Caution

- In case of preventing end of the wire from separating, treat its end with solder or use the below mentioned crimping terminal with insulation sleeve. (Refer to maker's catalogue "WAGO made" for handling them.)
 For AWG22 0.3 sq: 216-322 light green
 For AWG20 0.5 sq: 216-221 white
 Press tool: 206-204 Bio-crimp

How to connect to the terminal stand board

Push the lever with a driver etc.
 Make sure of stripped wire length, and insert them until the end without separating.
 Remove the driver from the lever.
 Make sure of wiring by pulling the electric wire slightly.

Stripped wire length: 6mm

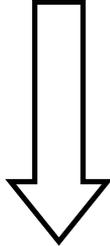
【 10. Test run 】

Hydraulic circuit

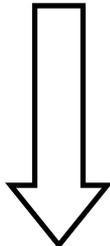
After completing pouring fixed amount of hydraulic oil into tank, piping, and wiring, perform test run.

Before power on, make sure to reconfirm wiring of earth or power source cables properly.

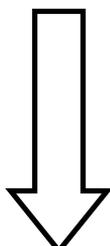
Starting confirmation



Flushing operation



Changing oil



Removing air

- Turn the switch of machine controller “ON”.

Confirm the pump rotation sound, pressure rising by the indication panel.

Confirm AC fan motor rotation of oil-cooler.

Note) It takes about 2 seconds that starting this hydraulic unit after power on.

It may take time to raise pressure more than setup pressure and output pressure switch signal by piping lengthen (Oil volume).

In this case, setup main machine not to receive alarm output.

- After confirmation of the start, perform flushing operation about 2hours with flowing the oil in circuit pressure at 1-1.5 MPa (low pressure). As flushing operation, connect all piping with loop style except the actuator, and operate through the return filter.
- While flushing operation, confirm piping properly at each part, or oil leakage.

- After completing the flushing operation, first confirm return filter indicator, if it clogged, replace filter element, then, remove hydraulic oil in the tank completely out of drain plug.

- Pour fixed amount of fresh hydraulic oil to the oil inlet port with air breather.

(Within NAS 9 class pure oil is used as fresh hydraulic oil.)

- Remove the air of hydraulic circuit completely.

If the air has not been removed thoroughly,

Abnormal operation of actuator, such as cylinder

Abnormal noise in the pump or in the valve may occur.

Note: As for the return filter and the element might to be changed, after confirming return filter form loading on unit, arrange/replace it.

 **Danger**

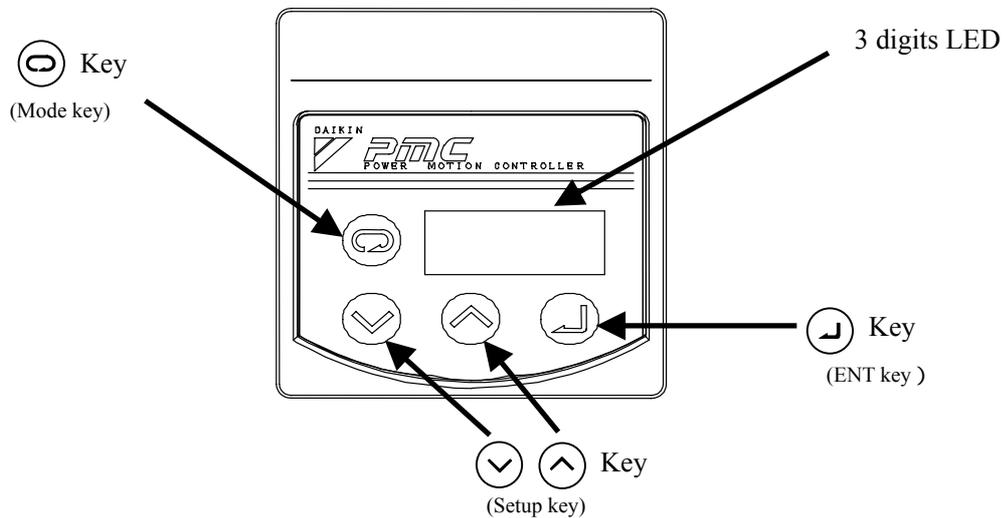
- In the process of air removing, be careful because there is a case of high pressure or high temperature oil spouts.

【 11. Operation manual of the control panel 】

It is easy for this hydraulic unit to monitor, setup, and adjust such as pressure/flow by operation of controller key switch.

■ General description

The control panel is composed of 3 digits LED **88.8**, mode key , setting key  , and ENT (enter) key , it normally indicates the actual pressure, and possible to change each mode as monitor indication and setting indication by key switching.

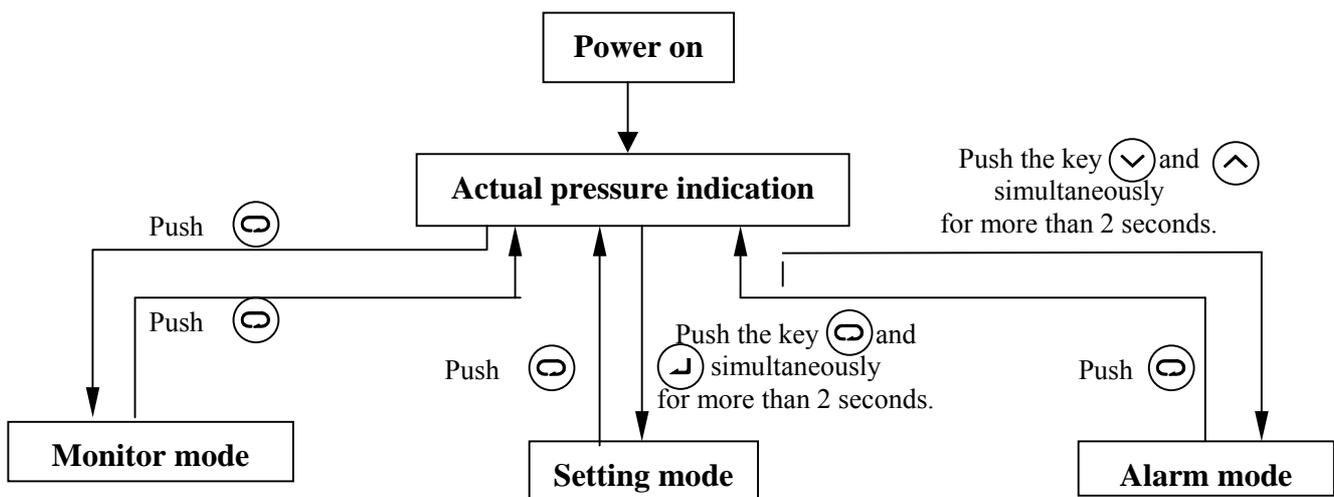


Explanation of each mode

- Normal mode: indicate actual pressure and alarm code
- Monitor mode: indicate pressure switch setup value, pressure setup value for each, flow setup value for each, actual flow, actual revolution speed.
- Setting mode: practice set up/change of pressure or flow.
- Alarm mode: It is possible to confirm alarm occurrence record.

Shift to each mode

The key switch operation of shift to each mode is as following figure.



Operation manual of each mode

a) Monitor mode

While monitor mode, it is possible to monitor item on the table below by choice.

Item	Content	
n00	Pressure switch setup value	(MPa) [in case of choosing PSI unit × 10PSI unit] Indicate pressure switch setup value.
n01 Note) 1	Pressure setup value	(MPa) [in case of choosing PSI unit × 10PSI unit] Indicate pressure setup value of present PQ choosing number high and low pressure alternatively.
n02	Discharge volume setup value	(L/min) Indicate discharge volume setup value of present PQ choosing number small and large discharge flow alternatively.
n03	Discharge volume	(L/min) Indicate present discharge volume.
n04 ^{note)2}	The latest alarm code	Indicate the code of the latest occurred alarm.
n05	Revolution	(min ⁻¹) Indicate present revolution.
n06	Operation mode indication	Indicate present switching mode (joining/dividing flow) of solenoid operated valve operation mode, and present PQ choosing number.
n07	Reverse revolution of stopping power supply	Indicate reverse revolution caused by motor reverse of loading, in case of stopping the unit power supply. It is be used for load volume estimate of machine.
n08	Regenerative load integration rate indication	Indicate load integration rate of present regenerative breaking resistance.

Note) 1

As for the setup in factory, standard is MPa indication. Make sure to treat such as indication sticker to identify PSI setup, in case of changing PSI mode.

If using the machine without any indication sticker in Japan, would be punished by the measuring law. Please arrange indication sticker in your company.

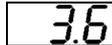
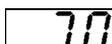
Note) 2

Refer to the alarm indication item, for the contents of alarm code.

It is possible to confirm actual number of power source input by pushing  key while alarm code indicating.

Refer to the operation example as below.

<Example> Monitoring actual discharge volume.

Operation	Key operation	3 digits LED	Remarks
<ul style="list-style-type: none"> • Start power supply ↓ (Start/Operation) • Actual pressure indication • Shift to monitor mode ↓ • Choosing item number ↓ • Monitor indication ↓ • Return to actual pressure indication 	<ul style="list-style-type: none">     	<ul style="list-style-type: none">      	<ul style="list-style-type: none"> Push  3 times Flash 3.6 L/min Discharge volume (theoretical value)

To monitor other item, choose the monitor item after returning the actual pressure indication.

b) Setup mode

While setup mode, it is possible to setup or change of pressure/flow by operation panel.

While setup mode, item (content) or adjustment range of setup/change, refer to the table on page27,page28.
Concerning initial setting-value or adjustment range of non-standard or special required type product, refer to the independent delivery specifications.

Note:

Above mentioned setup value of discharge volume is theoretical value (multiply of theoretical displacement and revolution), may differs slightly to the actual discharge volume.

Setup value of flow volume shown by interval of [theoretical displacement volume $\times 100\text{min}^{-1}$], so that it cannot be the integer. And also indicating the number of rounded off to one decimal place after the calculation as a flow volume.

While setup mode, it is possible to setup (adjust) item on the table below by choice.

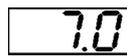
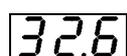
No	Title	Content
P00	PQ choice setup for 0 pressure/flow	Mode for setup pressure/flow of each PQ choice No Items are setup as follows: PL 《pressure setup》 qL 《flow volume setup》
01	PQ choice setup for 1 pressure/flow	
P02	PQ choice setup for 2 pressure/flow	
P03	PQ choice setup for 3 pressure/flow	
P04	Intensified pressure rate setup value at PQ choice change	Setup intensified pressure time (unit: second/MPa), in case of intensifying setup pressure after PQ choice change.
P05	Reduced pressure hour setup value at PQ choice change	Setup reduced pressure time (unit: second/MPa), in case of reducing setup pressure after PQ choice change.
P06	Increased speed rate setup value at PQ choice change	Setup increasing time (unit: second/1000min ⁻¹), in case of increasing setup flow after PQ choice change.
P07	Decreased speed rate setup value at PQ choice change	Setup decreasing time (unit: second/1000min ⁻¹), ¹ in case of decreasing setup flow after PQ choice change
P08	Setup of maintenance for pressure switch indication	Setup of function by indicating the action of pressure switch. Details about function refer to “alarm code and classification at sight” on page 30.
P09	Setup of switching pressure unit	Switch unit of normal pressure indication “ MPa ”to “ × 10PSI ”.
P10	Output permission of thermistor related	Setup output function of motor and controller alarm for temperature.
P11	Switching start/stop signal	Setup start/stop operation, while signal input.
P12	Pressure switch setup	Setup pressure switch effective/ineffective or operation pressure.
P13	Setup of pressure alarm delayed output time	Setup the time delay between pressure of pressure switch decreased to the operation pressure and output.
P14	Response gain	Adjust control response value. (It becomes as sensitive as this value is small.)
P15	Command rate of regenerated load	Adjust regenerated load, in case of growing regenerated load by normal pressure response (FF DH).
P16	Un-use setup item	Though it is not influence operation because of un-used, do not change the setup.
P17		
P18	Alarm output mixed setup	It sets up contact point output (alarm, warning and pressure switch) whether outputs independently or unity as one point. (Refer to the time chart of the attached document.)

Concerning the setup of P14 to P15, generally no need to change setup, in case of special circuit occasion such as extra load volume, need to change setup.

- Changing process of flow setup

Operation examples are as follows.

< example > PQ choosing 1: low pressure flow 39.7L/min change into that of 32.6L/min.

Operation	Key operation	3 digit LED	Remarks
<ul style="list-style-type: none"> • Power supply on 			
<ul style="list-style-type: none"> • Actual pressure indication 		15.7	
<ul style="list-style-type: none"> • Setup mode 	 Push two keys simultaneously for more than 2 seconds.		2 seconds later
<ul style="list-style-type: none"> • Choosing item No. 	 or 		
<ul style="list-style-type: none"> • Setup value indication 			Indicate pressure setup value of high pressure for choosing PQ 1
<ul style="list-style-type: none"> • Choosing PQ item 	Push 		
<ul style="list-style-type: none"> • Changing setup value 	Indicate in the order of PL1 qL1 		Indicate pressure setup value of low pressure for choosing PQ 1
<ul style="list-style-type: none"> • Setup value entry 			
<ul style="list-style-type: none"> • Changing setup value 			
<ul style="list-style-type: none"> • Setup value entry 			
<ul style="list-style-type: none"> • Changing setup value 			
<ul style="list-style-type: none"> • Return to actual pressure indication 			

Note:

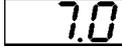
Setup value of flow shown by interval of [theoretical displacement $\times 100\text{min}^{-1}$], so that it cannot be the integer. And also indicating the number of rounded off to one decimal place after the calculation as flow.

	Theoretical displacement (cc/rev)
SUT03S30L10-10-F	8.83

• Changing process of pressure setup

Operation examples are as follows

< example > PQ choosing 1: pressure of low pressure 7.0MPa change into that of 6.0MPa.

Operation	Key operation	3 digit LED	Remarks
<ul style="list-style-type: none"> • Power supply on 			
<ul style="list-style-type: none"> • Actual pressure indication 			
<ul style="list-style-type: none"> • Setup mode 	 Push two keys simultaneously for more than 2 seconds.	 	2 seconds later
<ul style="list-style-type: none"> • Choosing item No. 	 or 	 	
<ul style="list-style-type: none"> • Setup value indication 		 	Indicate pressure setup value of high pressure for choosing PQ 1
<ul style="list-style-type: none"> • Changing setup value 	 or 		
<ul style="list-style-type: none"> • Setup value entry 		  	
<ul style="list-style-type: none"> • Return to actual pressure indication 		 	

(Setup range) SUT03S15L16-10-F

Item No.	Contents	Initial setup value	Usable range ^{note1}	Indication unit
Setup of pressure/flow for PQ choosing 0				
P00	PL0: pressure setup	1.5	1.5 ~ 16.2	(MPa)
		21	21 ~ 234	(× 10 PSI)
	qL0: flow setup	18.0 ^{注3}	2.4 ~ 18.0	(L/min)
Setup of pressure/flow for PQ choosing 1				
P01	PL1: pressure setup	1.5	1.5 ~ 16.2	(MPa)
		21	21 ~ 234	(× 10 PSI)
	qL1: flow setup	18.0 ^{注3}	2.4 ~ 18.0	(L/min)
Setup of pressure/flow for PQ choosing 2				
P02	PL2: pressure setup	1.5	1.5 ~ 16.2	(MPa)
		21	21 ~ 234	(× 10 PSI)
	QL2: flow setup	18.0 ^{注3}	2.4 ~ 18.0	(L/min)
Setup of pressure/flow for PQ choosing 3				
P03	PL3: pressure setup	1.5	1.5 ~ 16.2	(MPa)
		21	21 ~ 234	(× 10 PSI)
	QL3: flow setup	18.0 ^{注3}	2.4 ~ 18.0	(L/min)
P04	Intensified pressure rate setup value at PQ choice change	0.10	0.01 ~ 1.00	(sec/MPa)
P05	Reduced pressure rate setup value at PQ choice change	0.10	0.01 ~ 1.00	(sec/MPa)
P06	Increased speed rate setup value at PQ choice change	0.10	0.01 ~ 1.00	(sec/ × 1000min ⁻¹)
P07	Decreased speed rate setup value at PQ choice change	0.10	0.01 ~ 1.00	(sec/ × 1000min ⁻¹)
P08	Setup of hold for pressure switch indication	0	0: NO function 1: Indication hold of operation 2: Indication and memory of operation	-
P09	Setup of switching pressure unit	0	0: MPa indication 1: PSI indication	-
P10	Output permission of thermister related	1	0: No indication of operation 1: Indication hold of operation	-
P11	Switching start/stop signal	1	0: Input 0, start operation 1: Input 1, stop operation	-
P12	Pressure switch setup	0.0	0 ~ 35.0 (0: No function)	(MPa)
			0 ~ 507 (0: No function)	[in case of choosing PSI unit × 10PSI unit]
P13	Setup of pressure alarm delayed output time	0.00	0.00 ~ 9.99 (Max. 9.99seconds)	(sec)
P14	Response gain ^{note2}	40	10 ~ 999 (It becomes as fast response as this value is small)	-
P15	Command rate of regenerative load	100	30 ~ 100	(%)
P16	Un-use setup item	0.00		
P17		0		
P18	Alarm output mixed setup	1	0: independent alarm output 1: unity alarm output ^{Note 4} Refer to attached document.	-

^{note 1} Mind to use within the usable range, though setup/ adjustment with a control panel can be setup against usable range of above table.

^{note 2} In normal load volume, no needs to adjust a response gain.

In case of changing inappropriate gain, unstable phenomenon or surge pressure might occur.

^{note 3} Setup value of flow shown by interval of [theoretical displacement × 100min⁻¹], so that it cannot be the integer. And also indicating the number of rounded off to one decimal place after the calculation as flow.

In case it cannot be set up the value as demand, setup the closest value as demand.

^{note 4} It sets up contact point output (alarm, warning and pressure switch) whether outputs independently or unity as one point.

(Setup range) SUT03S30L10-10-F

Item No.	Contents	Initial setup value	Usable range ^{note1}	Indication unit
Setup of pressure/flow for PQ choosing 0				
P00	PL0: pressure setup	10.0	1.5 ~ 10.0	(MPa)
		145	22 ~ 145	(× 10 PSI)
	qL0: flow setup	25.6 ^{Note3}	3.5 ~ 39.7	(L/min)
Setup of pressure/flow for PQ choosing 1				
P01	PL1: pressure setup	10.0	1.5 ~ 10.0	(MPa)
		145	22 ~ 145	(× 10 PSI)
	qL1: flow setup	25.6 ^{Note3}	3.5 ~ 39.7	(L/min)
Setup of pressure/flow for PQ choosing 2				
P02	PL2: pressure setup	10.0	1.5 ~ 10.0	(MPa)
		145	22 ~ 145	(× 10 PSI)
	QL2: flow setup	25.6 ^{Note3}	3.5 ~ 39.7	(L/min)
Setup of pressure/flow for PQ choosing 3				
P03	PL3: pressure setup	10.0	1.5 ~ 10.0	(MPa)
		145	22 ~ 145	(× 10 PSI)
	QL3: flow setup	25.6 ^{Note3}	3.5 ~ 39.7	(L/min)
P04	Intensified pressure rate setup value at PQ choice change	0.1	0.01 ~ 1.00	(sec/MPa)
P05	Reduced pressure rate setup value at PQ choice change	0.1	0.01 ~ 1.00	(sec/MPa)
P06	Increased speed rate setup value at PQ choice change	0.1	0.01 ~ 1.00	(sec/ × 1000min ⁻¹)
P07	Decreased speed rate setup value at PQ choice change	0.1	0.01 ~ 1.00	(sec/ × 1000min ⁻¹)
P08	Setup of hold for pressure switch indication	0	0: NO function 1: Indication hold of operation 2: Indication and memory of operation	-
P09	Setup of switching pressure unit	0	0: MPa indication 1: PSI indication	-
P10	Output permission of thermister related	1	0: No indication of operation 1: Indication hold of operation	-
P11	Switching start/stop signal	1	0: Input 0, start operation 1: Input 1, stop operation	-
P12	Pressure switch setup	0	0 ~ 35.0 (0: No function)	(MPa)
			0 ~ 507 (0: No function)	[in case of choosing PSI unit × 10PSI unit]
P13	Setup of pressure alarm delayed output time	0	0.00 ~ 9.99 (Max. 9.99seconds)	(sec)
P14	Response gain ^{note2}	30	10 ~ 999 (It becomes as fast response as this value is small)	-
P15	Command rate of regenerative load	100	30 ~ 100	(%)
P16	Un-use setup item	Undefined		
P17		Undefined		
P18	Alarm output mixed setup	1	0: independent alarm output 1: unity alarm output ^{Note4} Refer to attached document.	-

^{note1} Mind to use within the usable range, though setup/ adjustment with a control panel can be setup against usable range of above table.

^{note2} In normal load volume, no needs to adjust a response gain.

In case of changing inappropriate gain, unstable phenomenon or surge pressure might occur.

^{note3} Setup value of flow shown by interval of [theoretical displacement × 100min⁻¹], so that it cannot be the integer. And also indicating the number of rounded off to one decimal place after the calculation as flow.

In case it cannot be set up the value as demand, setup the closest value as demand.

^{note4} It sets up contact point output (alarm, warning and pressure switch) whether outputs independently or unity as one point.

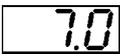
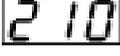
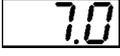
c) Alarm mode

While alarm mode, it is possible to confirm contents on the table below by choosing A00-A09.

Item No	Contents	Remarks
A00 - A09	Indication of alarm contents. (Refer to code attached table)	It becomes the latest alarm as small as the number.

Operation examples are as follows.

<Example> Confirm contents (E10 : IPM alarm) of an alarm (A01) before the latest one

Operation	Key operation	3 digit LED	Remarks
<ul style="list-style-type: none"> • Power supply on <li style="text-align: center;">↓ • Actual pressure indication • Alarm mode <li style="text-align: center;">↓ • Choose record number <li style="text-align: center;">↓ • Alarm content indication <li style="text-align: center;">↓ • Return to actual pressure indication 	  Push 2keys simultaneously for more than 2 seconds. Push  once.	  2 seconds later (Indicate the latest alarm)  Indication of an alarm before the latest one.	2 seconds later. Indicate alarm contents and power supply No. by turns in every 1 second.
	 	  	

The indication list of alarm code

The unit equipped with alarm detective function, which classified as follows.

Alarm code contents classification

Classification	Detection timing	Output status	Indication status	Action
	Normal operation	Refer to the table as below.	Alarm No. indication	Operation stop
	Power supply on Initialization		Flash indication of alarm No. and abnormal setup No. by turns.	
	Normal operation		Flash indication of warning No. and actual pressure by turns.	Operation continuation
	Normal operation		Indication of warning No.	

The list of alarm code and classification.

Classification	Alarm contents	Panel indication	Output status			
			Alarm a	Alarm b	Warning	Pressure SW
	Power off	-	×		×	×
	Normal power on	Actual pressure indication		×		
	Output device abnormal	E10	×			
	Momentary excess electric current	E11	×			
	Over speed	E12	×			
	Voltage shortage	E15	×			
	Over voltage	E16	×			
	Electron thermal	E17	×			
	Abnormal detection of magnetic pole	E18	×			
	Encoder break	E20	×			
	Motor wiring break	E21	×			
	Abnormality of pressure sensor system	E30	×			
	Abnormal motor start up	E31	×			
	Motor thermista break	E40	×			
	Abnormal motor temperature rise	E41	×			
	Heat radiation fin thermista break	E42	×			
	Abnormal fin temperature rise	E43	×			
	CPU out of control (watch dog)	E91	×		×	×
	Abnormal EEPROM data (1)	E93	×			
	Abnormal EEPROM data (2)	E94	×			
	Abnormal motor temperature warning	L44		×	×	
	Abnormal fin temperature warning	L45		×	×	
	Pressure decrease	L62		×	×	×
	Pressure switch operation ^{note1}	L63		×		×

^{note 1} Item No. 5: pressure switch operation (L63) alarm code is indicated, while in setup mode “P08” indication hold setup of pressure switch setup “1” or “2”, and “P12” pressure switch setup is completed.

Indication hold would not be canceled until press  key, while pressure switch indication maintenance setup is “1” or “2”.

In case of setup mode “P08” indication hold setup of pressure switch setup “2”, and “P12” pressure switch setup less than which pressure, memorized in alarm record.

- When alarm output mixed setup “P18” is “1”, the alarm is output even if warning and pressure switch operate.

Input and output signal specification

Controller of this unit equipped with input/output signal terminal to contact I/F from the outside.

Refer to the following pages about details of each signal wire specifications.

Terminal No.	Type	Terminal function	Wiring diagram sign	Remarks	
Terminal stand for input and output	1	Wiring prohibited.		Do not wire, as for this terminal, signal wire inside controller is not opened to user.	
	2				
	3				
	4				
	5				
	6	Digital input terminal.	Common digital input	COM2	Able to control operation of this unit from the outside. Input 0: input START/STOP control Input 1 and 2: PQ choice, 0-3 switching by combination.
	7		Digital input 0	DIN0	
	8		Digital input 1	DIN1	
	9		Digital input 2	DIN2	
	10	Digital connection output terminal.	Digital output 0	DOUT0	Able to output status of this unit. Refer to alarm code on page 29. Output 0: Warning Output 1: Pressure switch (When alarm output mixed setup "P18" is "0")
	11		Digital output 0	DOUT1	
	12		Common digital output	COM1	
	13		Connection output a	ALMa	
	14		Connection output b	ALMb	
	15		Common connection output	COM	
	16	Wiring prohibited			Signal wire inside the controller is wired by system side. Do not remove, as for this terminal is not opened to user.
	17				
	18				

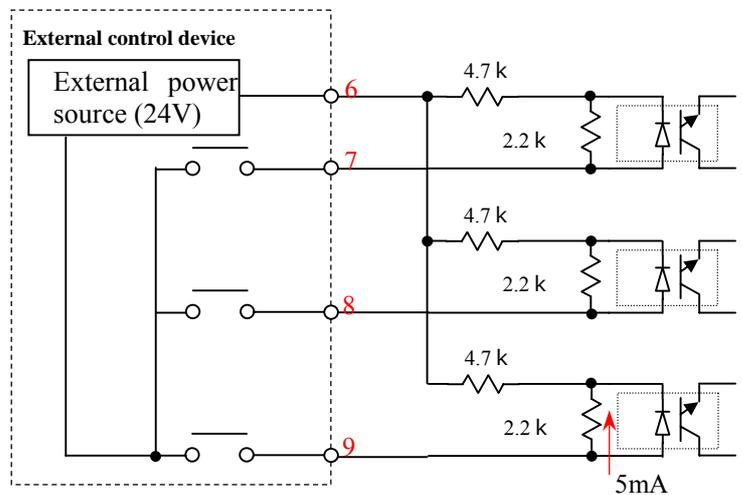
Digital input.

Sequencer input signal to control this unit from the outside. Connect as following point as required.

Terminal No.	Signal	Remarks
6	Common digital input	Minus common
7	Digital input 0	Control START/STOP. Able to switch input signal operation by switching START/STOP signal while setup mode (setup mode: P11). (Refer page 27)
8	Digital input 1	Able to switch PQ choosing 0-3, as combination of attached list. (Refer page 27, about setup of PQ choosing.)
9	Digital input 2	

Combination of PQ choosing digital input

PQ choice NO.	Digital input 1	Digital input 2
0	OFF	OFF
1	ON	OFF
2	OFF	ON
3	ON	ON



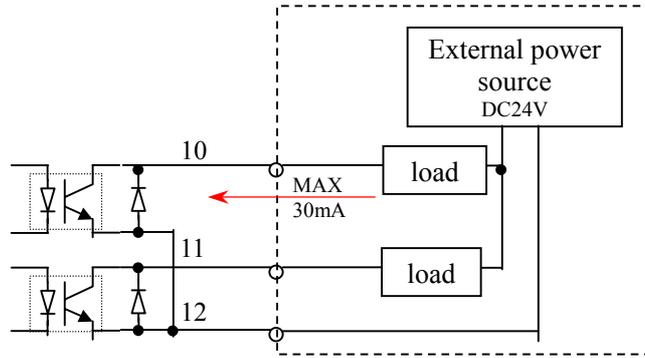
⚠ Caution

- Use more than DC24V \pm 1V/0.5A for external power source.
- It is impossible to supply power source from this controller to the exterior.
- Electric current for each input circuit is 5mA (Typ.)
Mind the minimum current around contact, in case of constructing circuit around contact.

Contact output

Contact signal of which output the status of alarm this unit. Connect as following point as required. Refer to alarm code (page 30) about output contents.

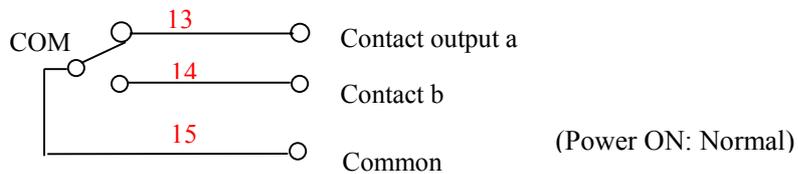
Terminal No.	Signal	Remarks
10	Digital output 0	Warning
11	Digital output 1	Pressure switch
12	Common digital output	Minus common



▲ Caution

- Use more than DC24V ± 1V/0.5A for exterior. It is impossible to supply power source from this controller to the exterior.
- Output circuit of this controller is minus common.
- Maximum output current of output circuit is 30mA(load resistance) for a circuit. In case of operating loading current more than permissible level, may damage the circuit.
- In case of operating inductive load, enforce surge prevention measure.

Terminal No.	Signal	Remarks
13	Contact output a	Alarm a
14	Contact output b	Alarm b
15	Common contact output	Common



▲ Caution

- OPEN/CLOSE volume of contact output is DC30V/0.5A(load resistance). In case of operating loading current more than permissible level, may damage the contact point.
- However, minimum applied load of connection output is DC10mV/10 μ A, it is minimum tentative value that open/close possible for minute loading.
- In case of operating inductive load, enforce surge prevention measure.

【 12.Maintenance 】

To maintain motor pump performance for long term and fine, operate periodical maintenance about following item, and if there is problem, perform repair or replacement.

An inspection time, period is shown as a standard on following table, it varies drastically depends on the use condition, environment, and so on.

Periodic inspection

Object/ item	Inspection time/period	Inspection principles
Oil tank • Confirmation of oil amount • Confirmation of oil temperature • Confirmation of oil color	daily • as required daily • as required Once / 6 months	Confirm float locates between red line and yellow line of oil gauge. Confirm hydraulic oil becoming muddy and bubble getting mixed. Confirm that it is less than 60 ° . (Normally, make sure to usable range among 15 -50 . It is possible to confirm deterioration of oil-hydraulic oil by color. If recognize oil color changing to dark-brown (ASTM level 4 : bright-yellow) , change hydraulic oil
Oil cooler • Fan motor rotation • Core part clogging	daily • as required daily • as required	Confirm fan motor rotation. Confirm occurrence of core clogging by visual observation. If the fan motor stop rotation or occurrence of core clogging, The cooling function of oil-cooler declines remarkably. Hydraulic oil or equipment becomes high temperature, and there is fear of the burn. So that quickens deterioration of hydraulic oil, and shortens the life of equipment. The motor becomes high temperature, and shortens the life of the motor. Heat radiation of controller becomes decreased, and shorten the life of electric parts. A fan motor makes not only hydraulic oil cool, but also make the motor and controller cool.
Pressure indication • Operation confirmation • Indicated pressure confirmation	daily • as required daily • as required	Confirm the indication change as change of loading condition. Confirm pressure indication value of DH as it setup.
Noise/ vibration	daily • as required	Confirm no abnormal noise or vibration.
Electric wiring	Once / 6 months	Confirm no crack and damage in covering material of wire. Measure insulation resistance, and confirm no decline of the insulation resistance Confirm to ground the earth properly.
Hose	Once/ a year	Confirm no crack, damage and flaw.
Screw/ piping	daily • as required	Confirm whether there is loosen part of screws or piping, oil leakage.

Cleaning and change

Object/item	Operation time/period	Operation principles
Oil tank, oil changing	Once/ a year	Change hydraulic oil periodically. Long time use of this hydraulic unit without changing oil may be harmful for operation and life of the hydraulic equipment.
Oil cooler, core cleaning	Once/ a year	Disassemble and clean, as following maintenance principle on page 35-36.
Oil inlet port with air-breather	Once/ a year	Disassemble and clean, as following maintenance principle on page 37.
Suction strainer	Once/ a year	Disassemble and clean, as following maintenance principle on page 38.

 Danger

Do not touch rotary point.

When touching the inside of the controller, observe the process to prevent an electric shock.

) Turn off the main power source of the hydraulic unit.

(Turn off the power source breaker of the circuit supplying a power.)

Put a bill such as “Operation prohibited (Working)” on the power source breaker, and prevent wrong operation.

) After more than 5 minutes pass, remove the cover of the terminal box and the terminal box.

Since large capacity condenser is used in the controller, if it operates under charging in the condenser there is fear of the electric shock. Be sure to leave more than 5 minutes (time to discharge electricity inside the condenser).

When starting operation, turn on electricity after installing all of the cover on the controller.

Oil-cooler maintenance principals

▲ Warning

Stop main power source and operation, before starting maintenance.
 Wear protective glasses and gloves, while operation.
) Be careful of fin part of core as it is sharp.
) Be careful not to get foreign substance into eye, while air-blow.

▲ Caution

Be careful not to load strong power on power supply wire or connector of fan motor, while operation.
 Be careful of oil leakage from piping or oil cooler, while disassembling.

1. Removing oil cooler

Open the controller cover and remove fan connector and fan earth.

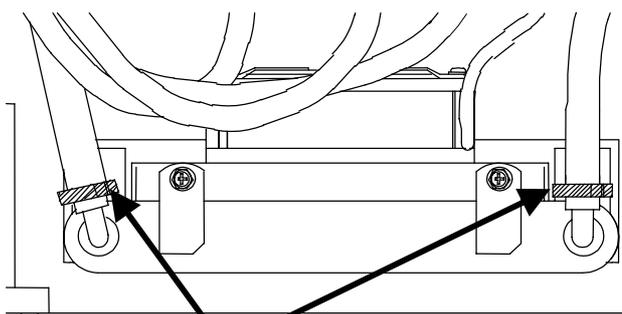
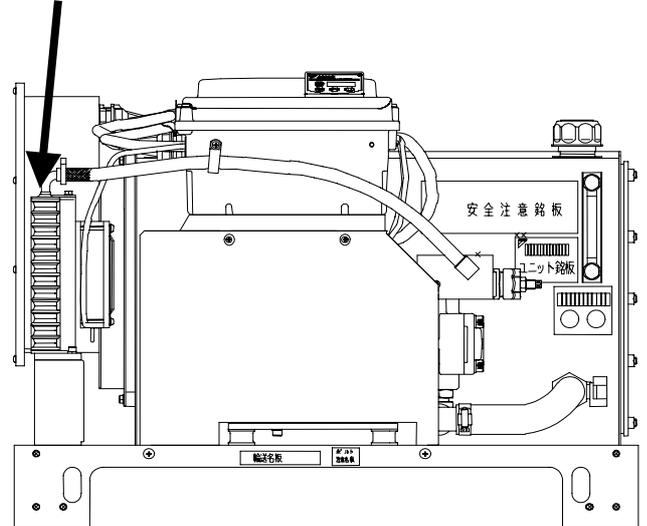
Unfasten hose bands (2 points), and remove hoses (2) on the top of the oil cooler.

Note) Blind plug or other protection of oil leakage should be fit on hose because of protecting back flow when removing.

Loosen hexagon socket bolt (M5 × L12 : 2), and remove oil cooler.

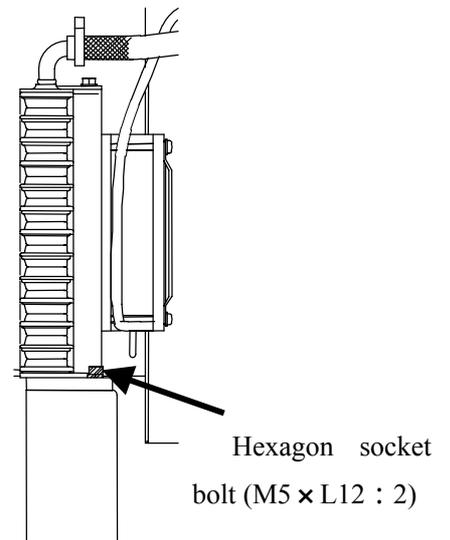
- There is a bolt on the unit back side as well.

Oil cooler



Hose band

Unit from upper side

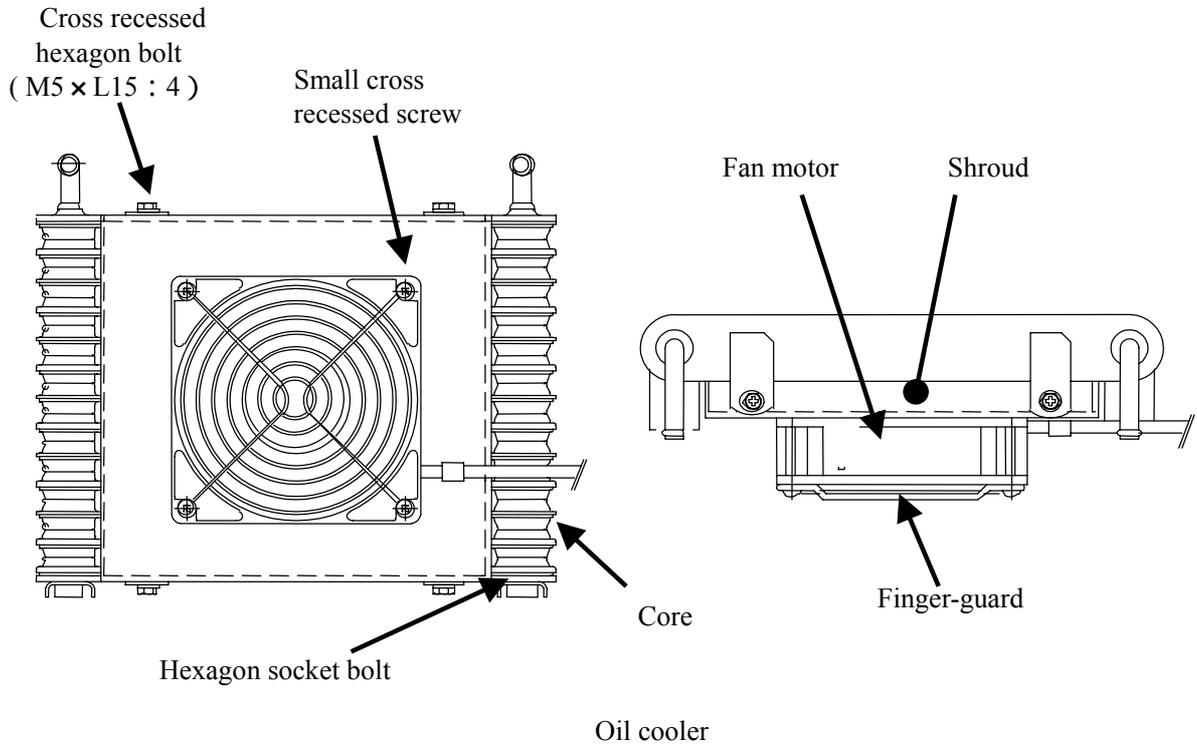


Unit from front side

2. Oil cooler disassembling

Loosen cross recessed hexagon bolt(M5xL12: 4), and divide core and shroud.

Loosen small cross recessed screw (M4xL7: 2), and divide shroud, fan motor and finger-guard.



3. Core cleaning

Blowing core by air or steam, and clean dust or drain stick / pile up on the fin.
Be careful not to get dust or sticking into inside the core, while blowing.

4. Fan motor cleanings

Clean not only fan body or casing parts, but also surroundings of fan and casing crevice with waste cloth.

 **Caution**

Do not steam/air blow.

Do not steam/air blow, otherwise a foreign substance get in the inside of the motor.

5. Re-assembling

Re-assemble as it was, after cleaning completed.

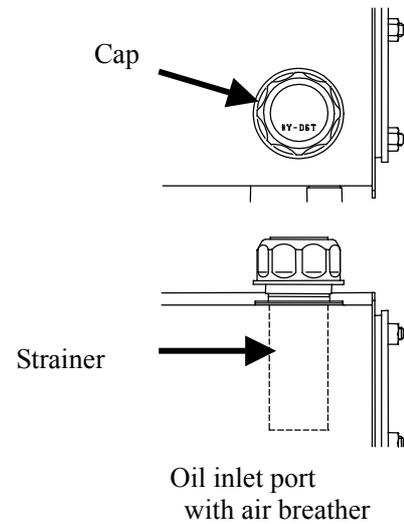
Confirm operation driven properly, as following test run on page 19, after re-assembling completed.

Be careful to setup inhalation/exhaust direction of oil cooler (page 13).

Oil inlet port with air breather maintenance principle

1. Removal

It is easy to remove, turn cap to the counterclockwise side by hand.



Warning

Wear protective glasses, while air blow operation, to prevent to get piled-ups or dust into the eye.

3. Installation direction

Turn a cap to clockwise by hand until it comes to stop, and it is installed.

Suction strainer maintenance principle

1. Removal

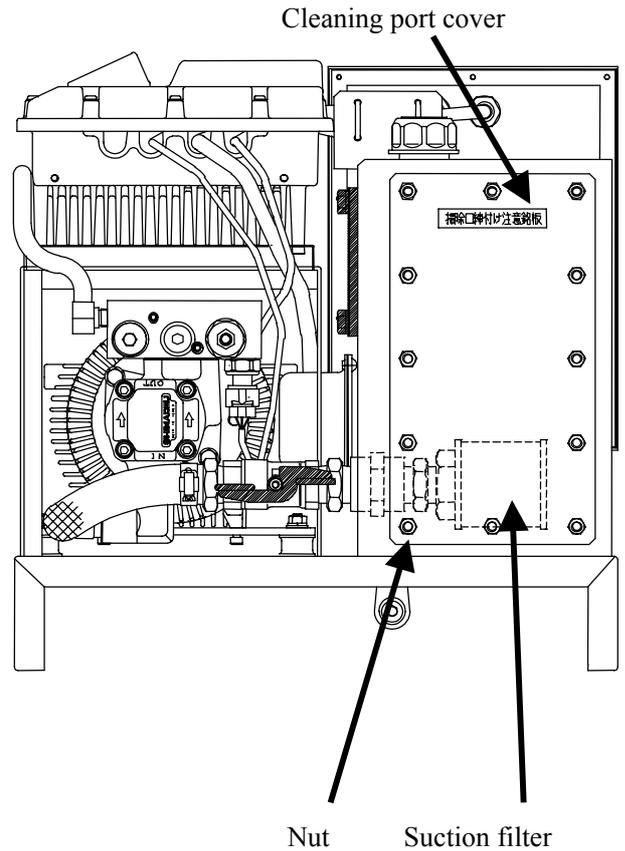
Loosen cleaning port nut (M8: 12), and remove cleaning port cover. As suction strainer can be seen, loosen and remove suction strainer (Hexagon subtends width : 41mm) .

2. Cleaning

Blow filter by air, and blow sticking/ piling up material off. Remove dust inside the cylinder of strainer.

3. Reassembling

After cleaning completed, reassemble as it was. Do reverse work of the removal. Confirm operation driven properly, as following trial operation on page 23, after reassembling completed.

 Warning

Wear protective glasses, while air blow operation, to prevent to get piled-ups or dust into the eye.

【Attached document: Adjustment point of the safety valve】

When it corresponds to the following two points, refer to “Adjustment point of the safety valve” and adjust the safety valve again.

1. In case of adjustment of the safety valve setup is necessary.

Even if it is used in maximum pressure setup, the setup that the safety valve does not work by usual pressure control, however, the long repetition or contaminant in the operating oil decreases the setup pressure of the safety valve, so that the safety valve works even if usual condition.

【How to judge it】

- In case oil temperature rises earlier than it was.
- In case the number of rotation decreases under pressure hold condition as indication of the number of rotation, safety valve adjustment screw is turned to tighten direction.

2. In case of restraining the surge pressure which is greatly beyond the setup pressure in the relation such as pressure-resistant of the hose as much as possible.

Adjustment point of the safety valve

Loosen the lock nut referring to the safety valve expansion figure of the bottom. (Lock nut is M10: width 14mm)

In accordance with the standard figure of the length of pressure adjustment screw, adjust it to about the screw length which cope with the pressure as a control pressure.

Power on the hydraulic unit, make the setup mode by the panel key operation, and adjust the pressure setup to the pressure as be settled.

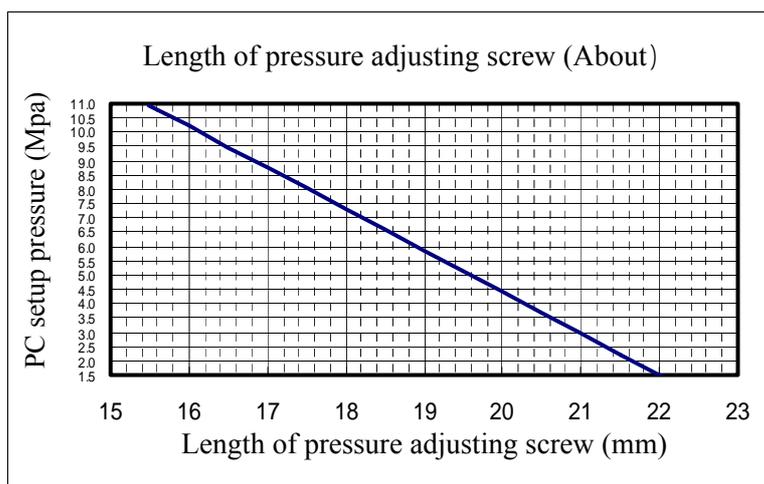
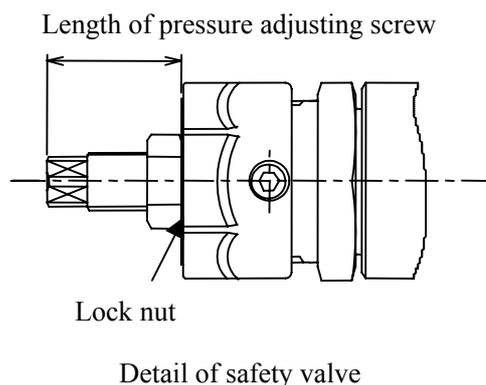
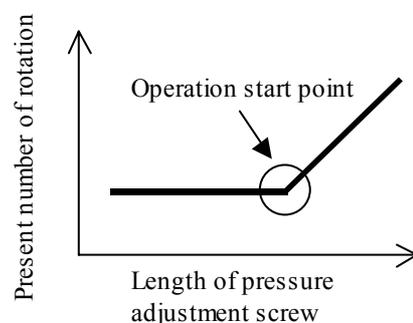
Choose [n05] (indication of the number of rotation) of the monitor mode by the panel key, and present number of rotation is indicated.

Adjust the length of pressure adjustment screw in the front-back direction, and find the operation start point of the right figure.

Tighten the pressure adjustment screw from the operation start point to turn 2/3 clockwise.

Tighten the lock nut, and adjustment is finished.

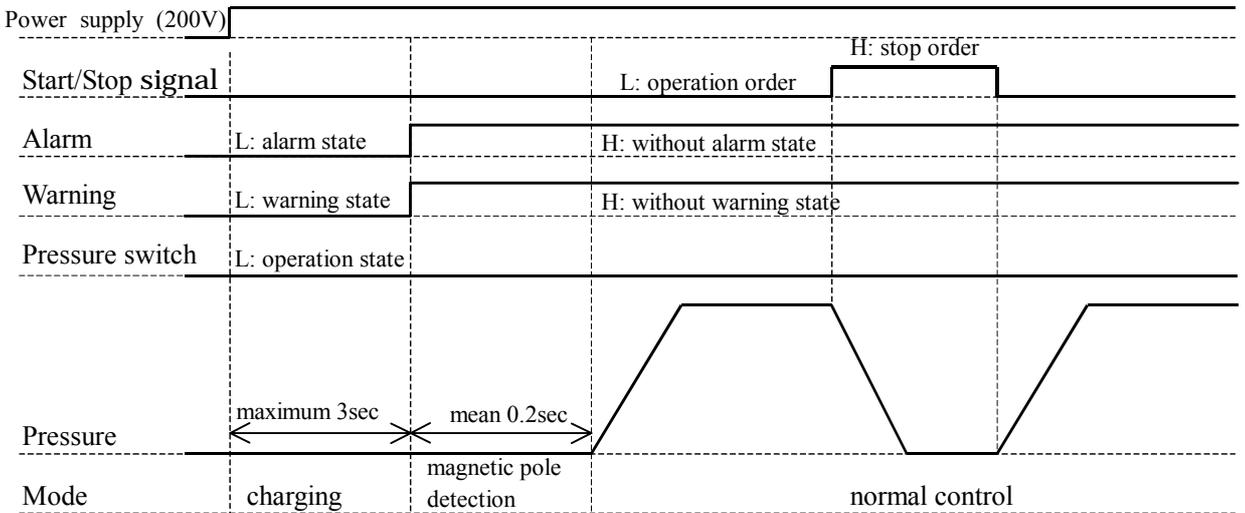
(Be careful not to turn the adjustment screw when tightening the lock nut.)



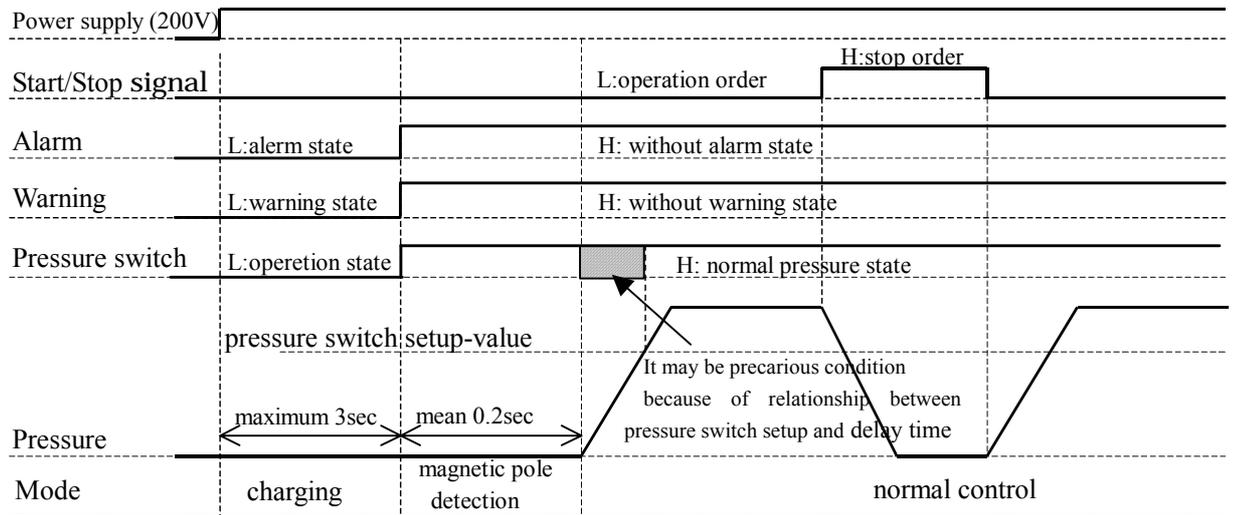
【 Attached document: Power on and alarm system time chart 】

1. When the set up item P18 is "0"

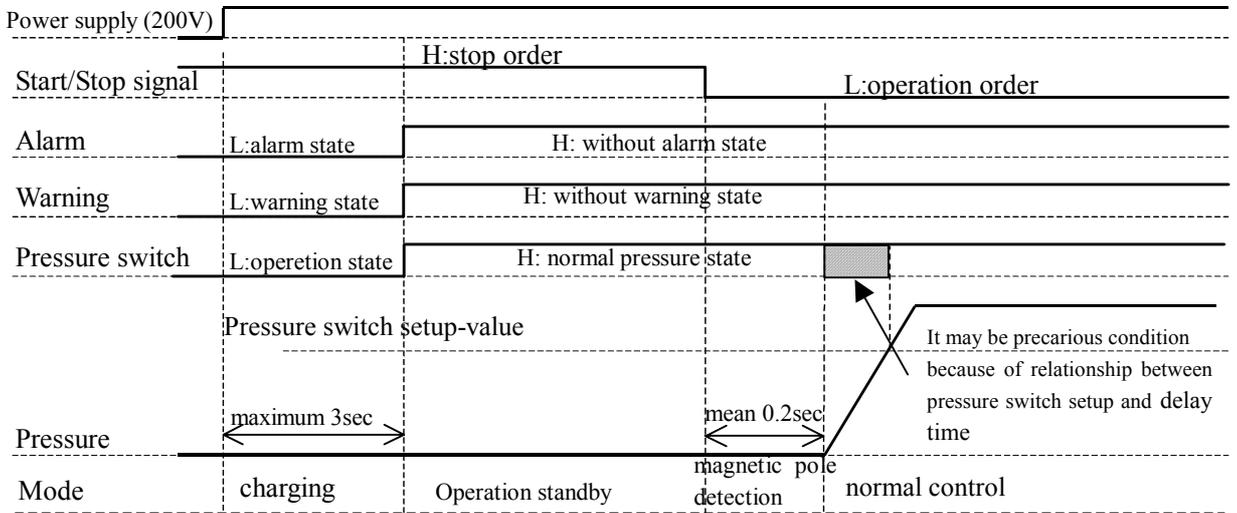
1-1 Without using pressure switch function



1-2 With using pressure switch function

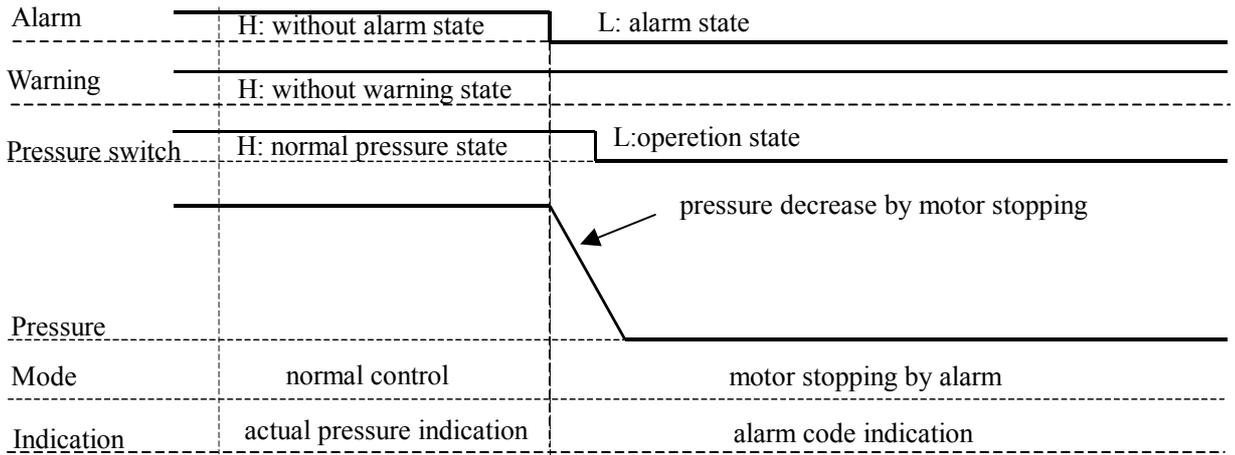


1-3 With using pressure switch function (Stopping when start power supply)

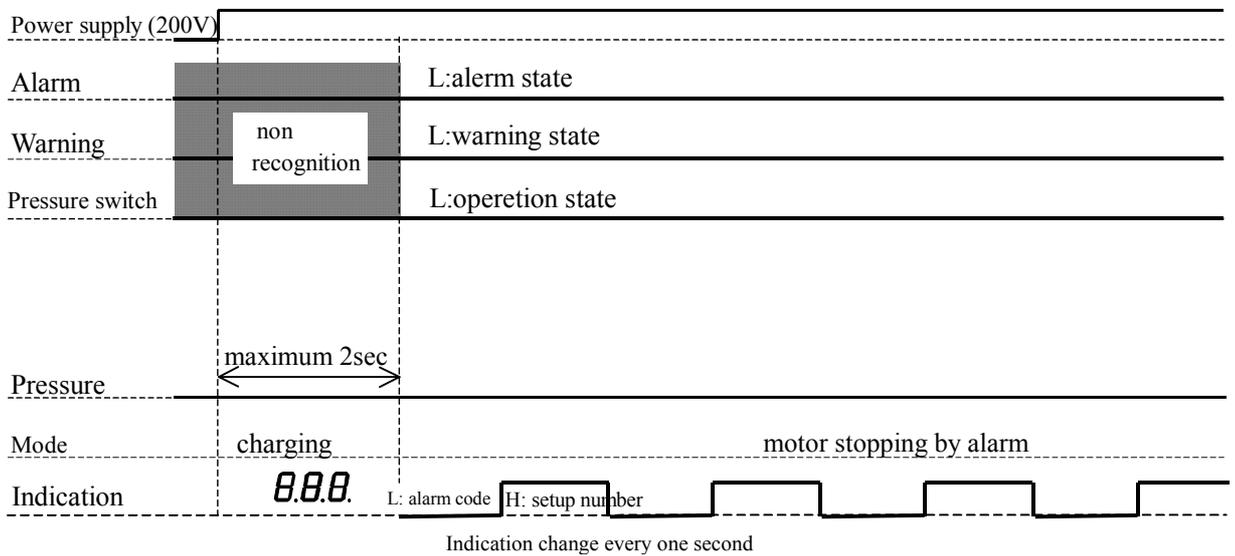


Magnetic pole detection is performed when first starting of motor.

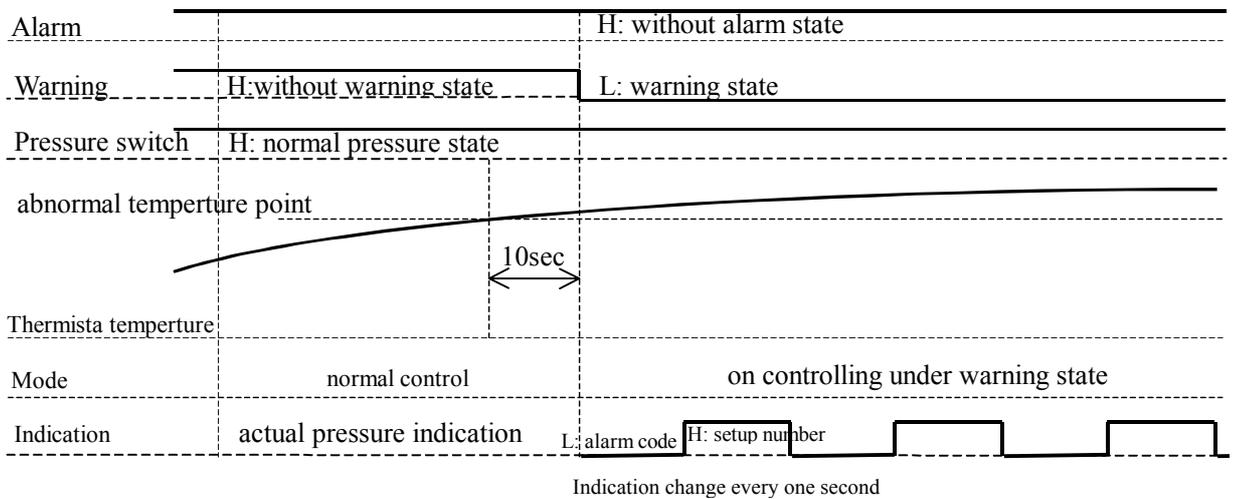
1-4 Alarm classification



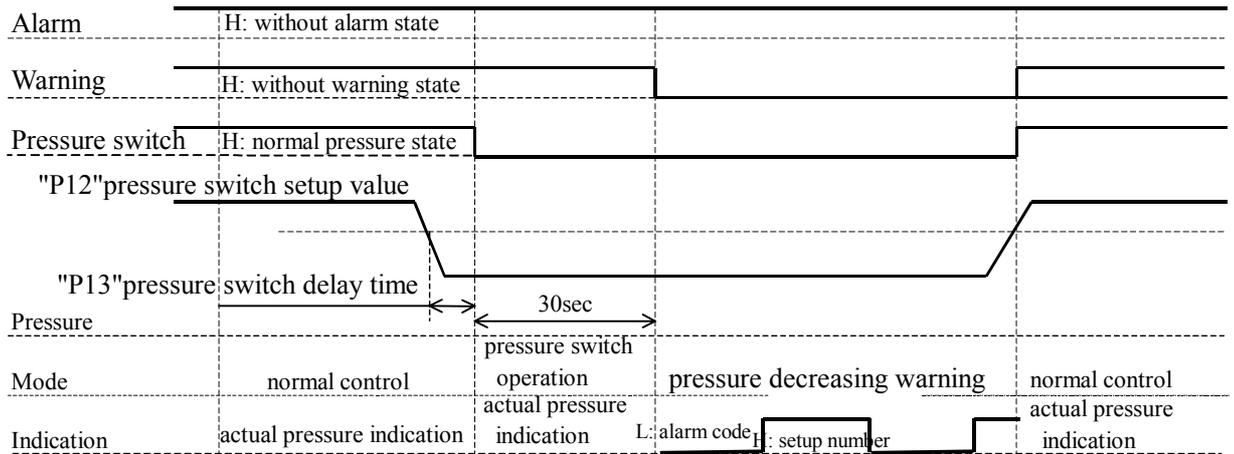
1-5 Alarm classification



1-6 Alarm classification

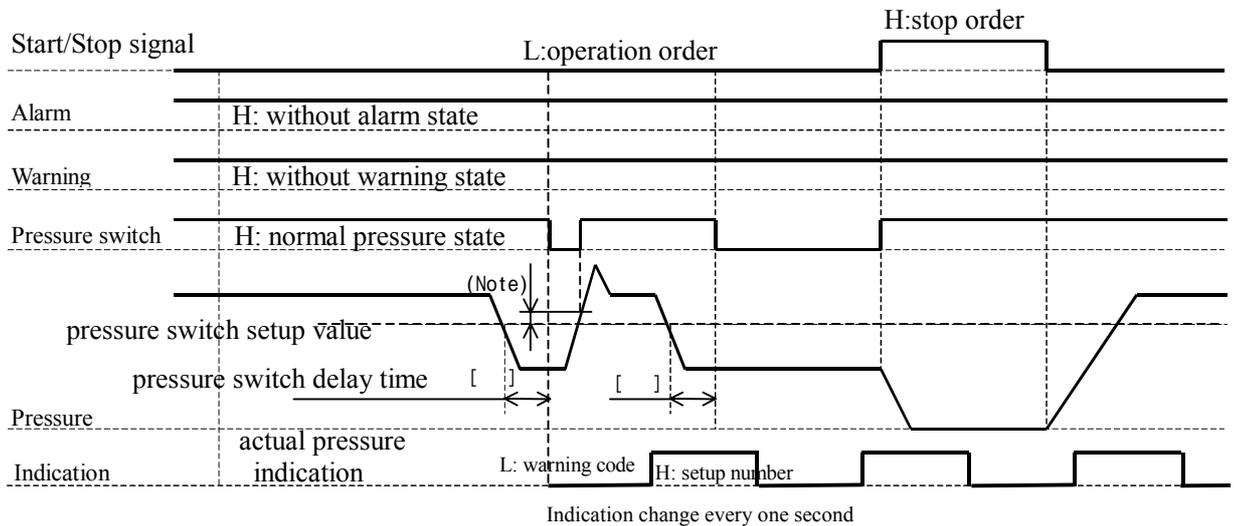


1-7 Alarm classification



While holding pressure switch operation indication warning code and actual pressure are indicated by turns

1-8 Alarm classification



Above mentioned condition show when “08” (Indication hold setup of pressure switch) is [1] or [2].

When “08” is [0], it is actual pressure indication.

While stop order by start/stop signal, pressure switch comes to normal state.

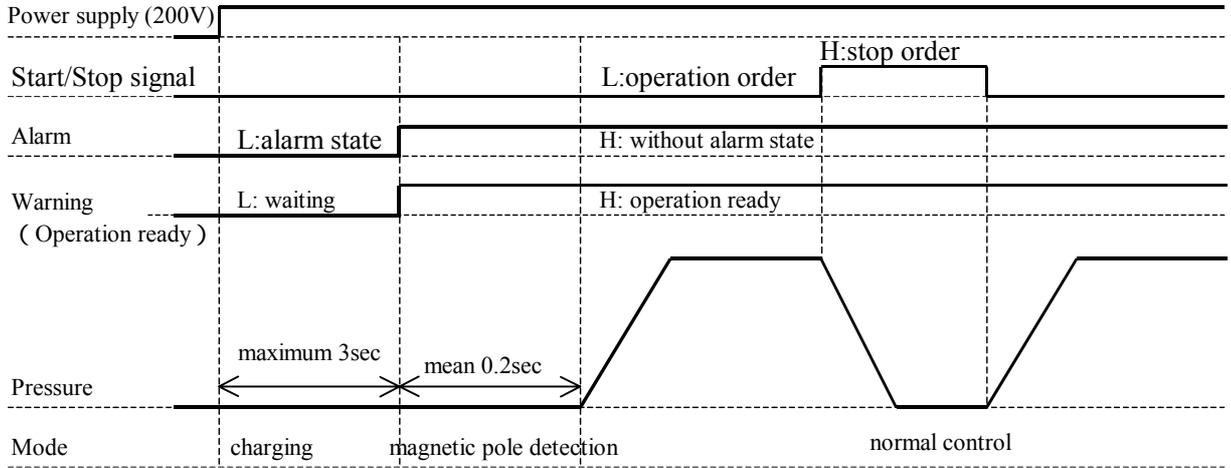
Concerning “P12” and “P13” setup, it is possible to change at setup mode. Refer to “(b) Setup mode, of Direction for operating each mode: P27” about its setup range.

Note) In case of alarm classification “1-8” as above diagram, pressure switch setup without non-sensitive zone for explanation. Actually, it is setup non-sensitive zone about 0.5Mpa.

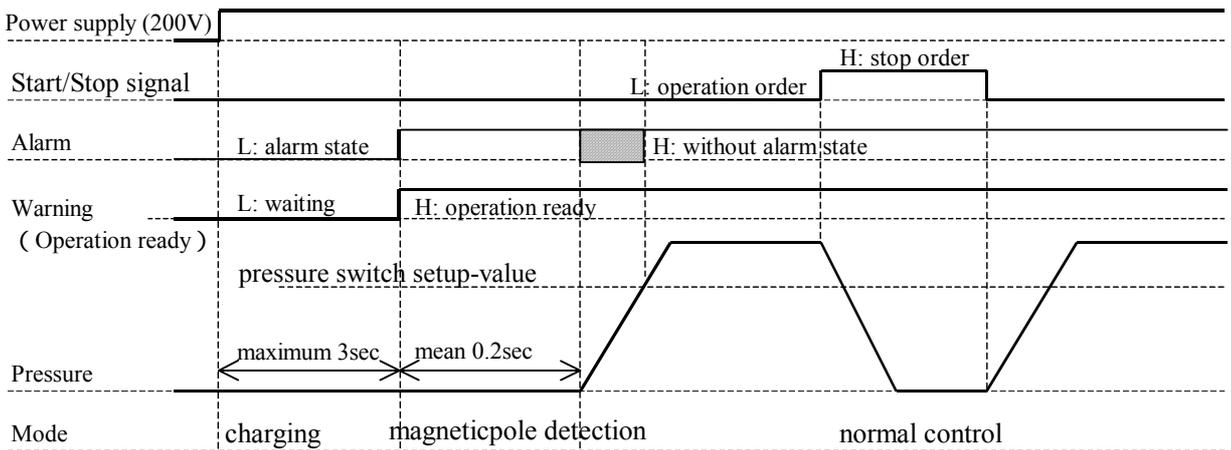
2. When the set up item P18 is “1”

When integrated alarm output is used, “warning output” of individual output is used for operation ready output.

2-1 Without using pressure switch function

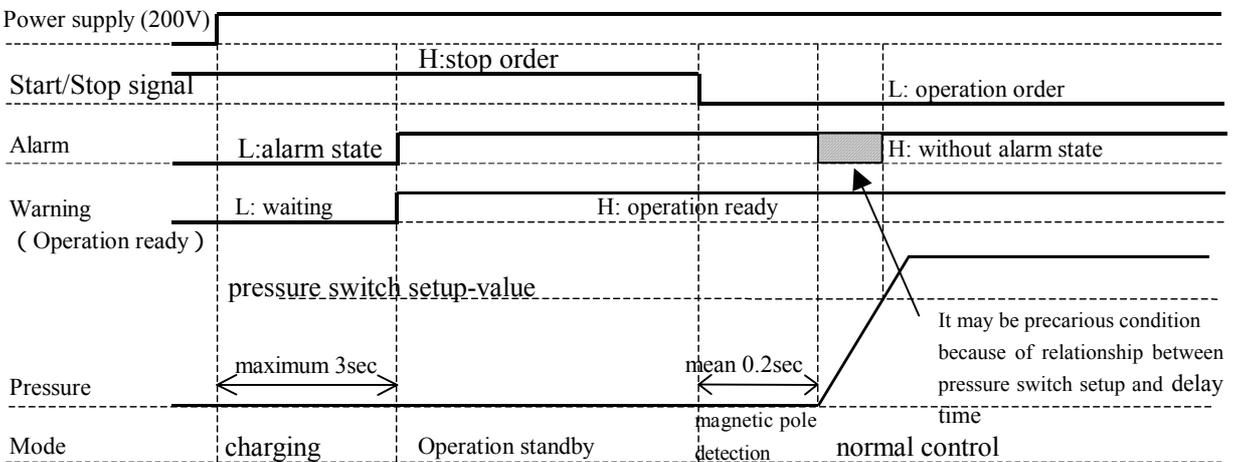


2-2 With using pressure switch function



It may be precarious condition because of relationship between pressure switch setup and delay time.

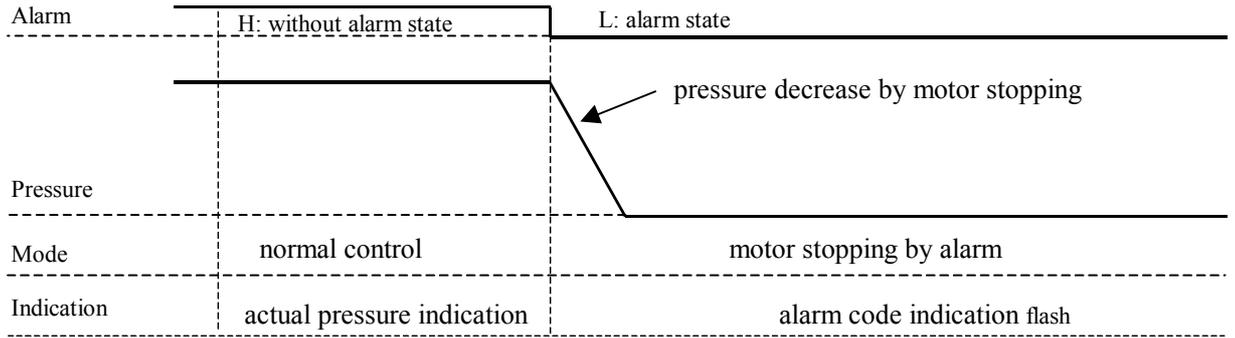
2-3 With using pressure switch function (Stopping when start power supply)



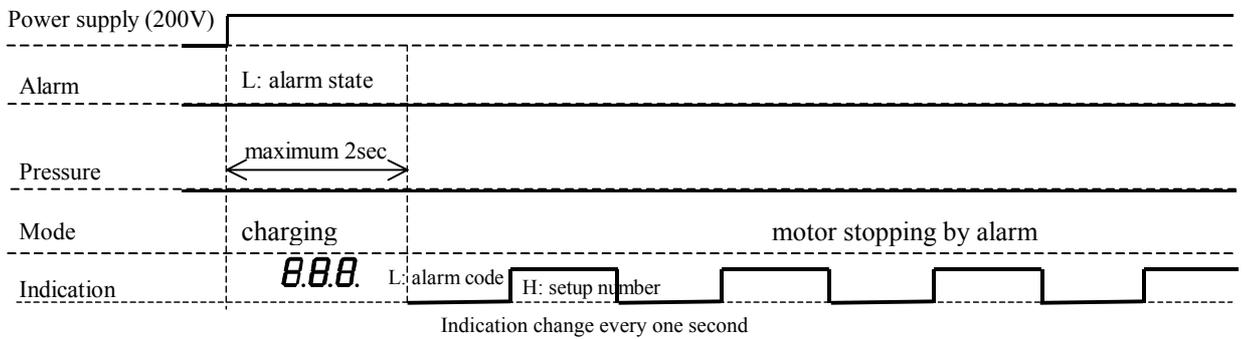
It may be precarious condition because of relationship between pressure switch setup and delay time

Magnetic pole detection is performed when first starting of motor

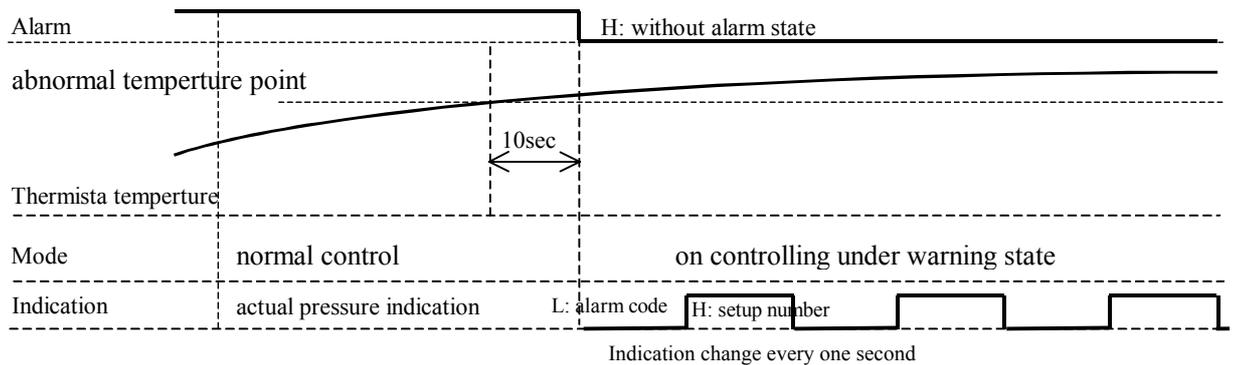
2-4 Alarm classification



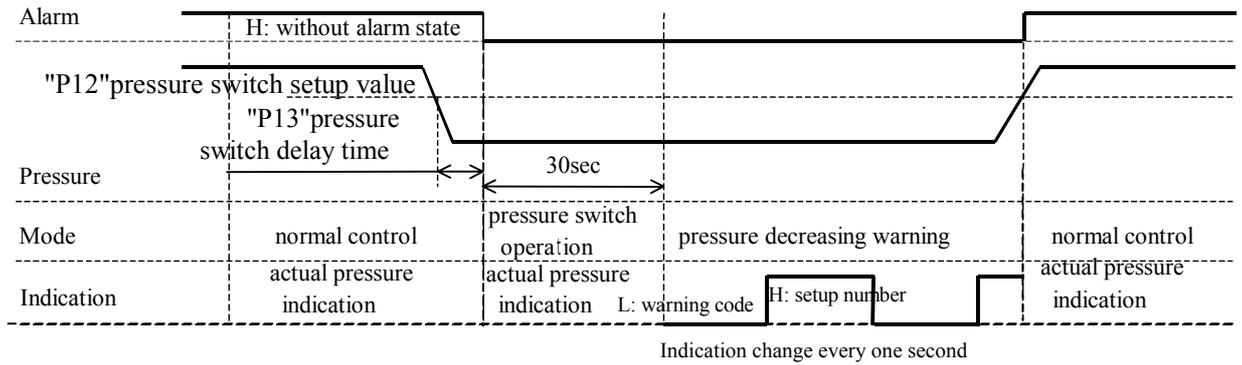
2-5 Alarm classification



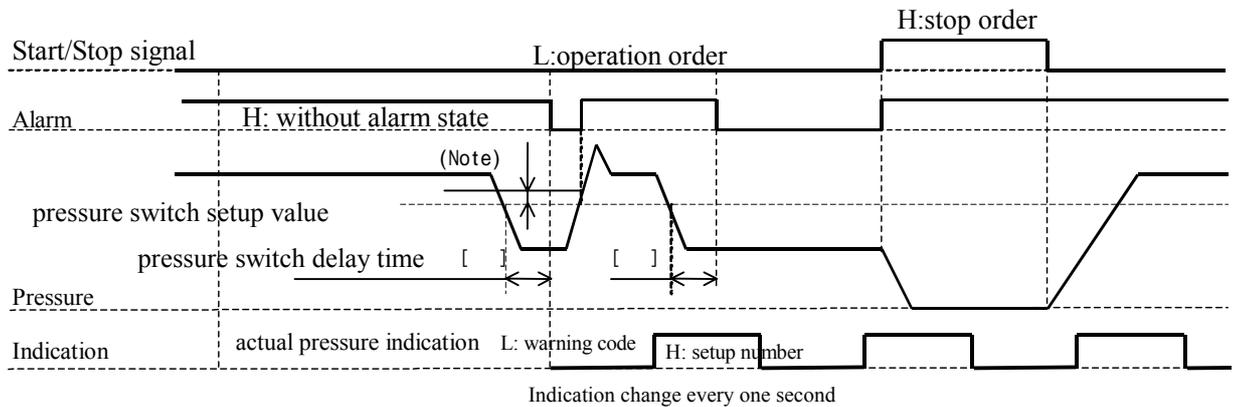
2-6 Alarm classification



2-7 Alarm classification



2-8 Alarm classification



Above mentioned condition show when “08” (Indication hold setup of pressure switch) is [1] or [2].

When “08” is [0], it is actual pressure indication.

While stop order by start/stop signal, pressure switch comes to normal state.

Concerning “P12” and “P13” setup, it is possible to change at setup mode. Refer to “(b) Setup mode, of Direction for operating each mode: P27” about its setup range.

Note) In case of alarm classification “2-8” as above diagram, pressure switch setup without non-sensitive zone for explanation. Actually, it is setup non-sensitive zone about 0.5Mpa.